A Scranton Gillette Publication

APRIL 1958

WATER & SEWAGE WORKS

UNIVERSITY MICROFILMS
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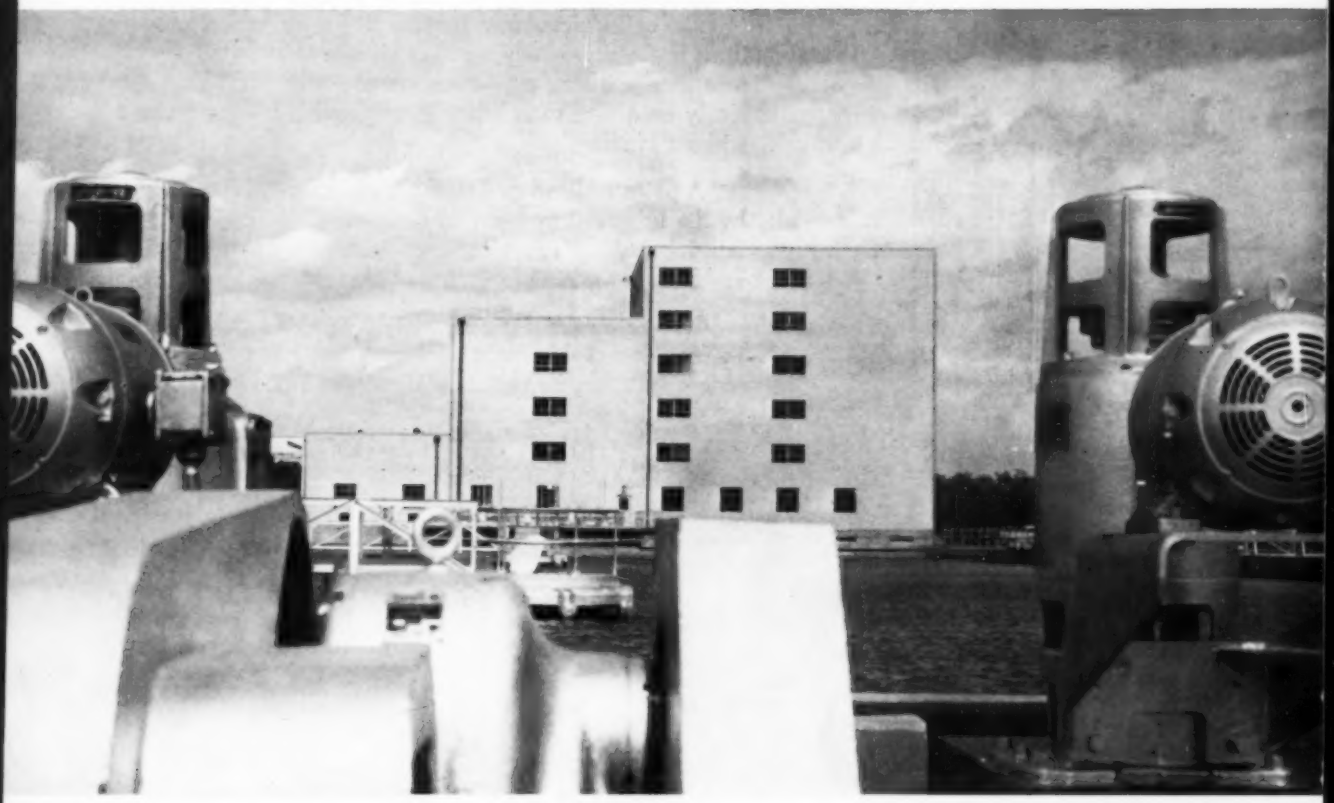
COMP

WATER SUPPLY • SEWAGE DISPOSAL



▲ **FRAMED between motors and gears on the mixing chambers, stands the "sky-scraper" chemical building of the Elm Fork Filtration Plant in Dallas City. Between the mixers and the chemical building are the sedimentation basins. Dallas is this year's host to the AWWA Convention. See pages 127 and 168.**

Well Drilling — p. 136
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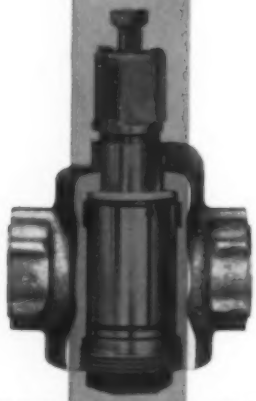
Plug rotates as journal

Smooth bearing-surface in body



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acf *Rectangular Port Valves in pump room of California sewage disposal plant.*

W-K-M

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5708

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OVER 40 miles of Vitrified Clay Pipe, in all diameters, go into Frankfort, Kentucky's new $2,500,000 sewer and treatment plant program. This extensive project is designed to eliminate the health menace involved in dumping untreated sewage into the Kentucky River and in the use of private disposal systems.

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City Officials: Robert C. Young, *Mayor;* Russel Marshall, *City Engineer;* Earl Harrod, *Chairman, Board of Public Works*

Engineer: Howard K. Bell

Contractor: G. E. Moore

C 358-1

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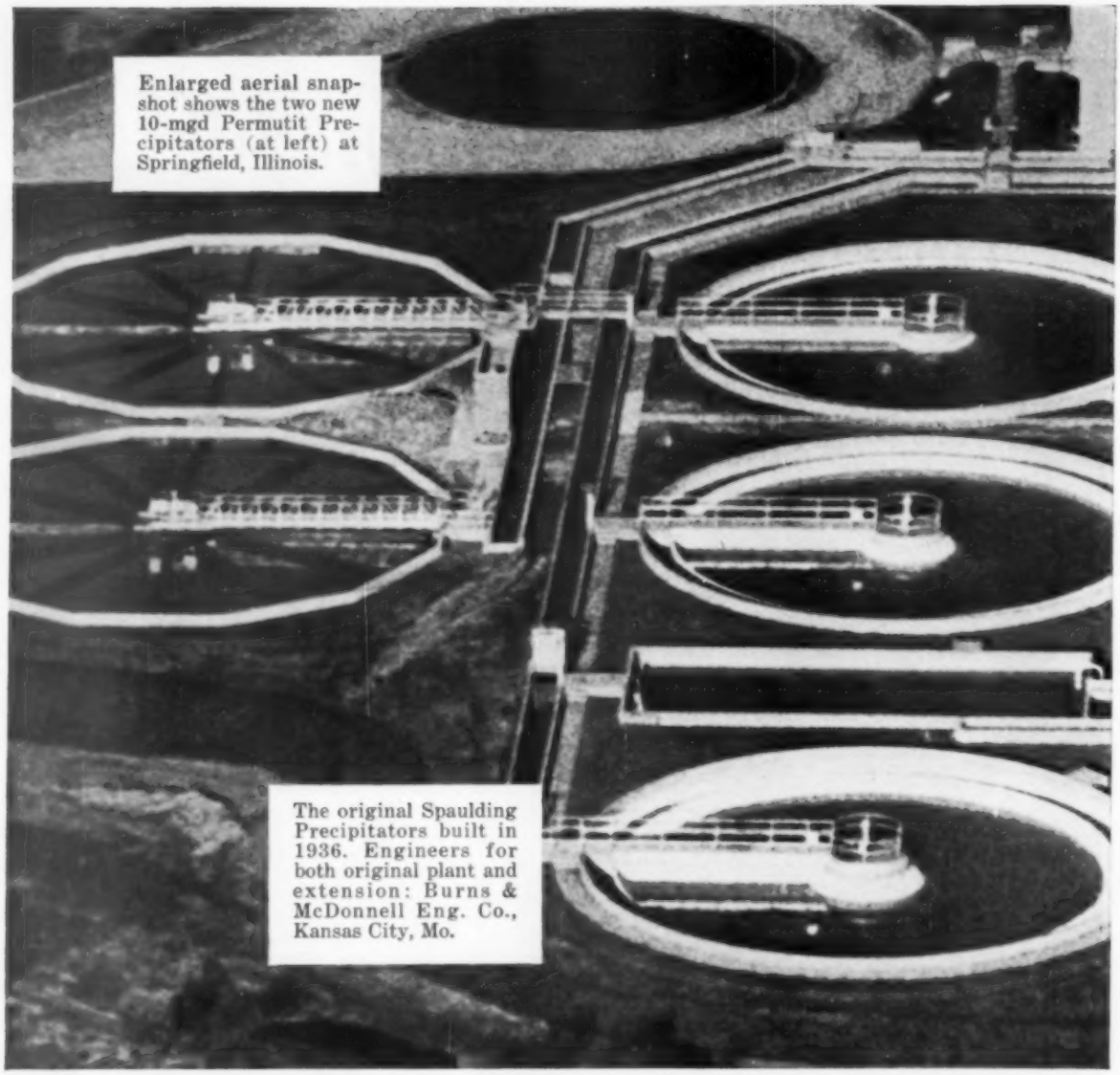

Enlarged aerial snapshot shows the two new 10-mgd Permutit Precipitators (at left) at Springfield, Illinois.

The original Spaulding Precipitators built in 1936. Engineers for both original plant and extension: Burns & McDonnell Eng. Co., Kansas City, Mo.

20-year record proves efficiency of upflow "Precipitators"

In 1936, Springfield built three short-detention, upflow softening-coagulation units newly developed by Charles H. Spaulding. From the start, the Spaulding-designed units showed high flow rates – many times faster than the old basin system, a uniform quality effluent that doubled filter capacity, a low chemical cost and a low maintenance cost.

When Springfield's recent expansion program called for doubling its water-treating capacity, city engineers had almost 20 years of proven performance to guide them, a longer performance record than is available with any other type of upflow, sludge-blanket unit. That's why Permutit Precipitators based on Spaulding designs were chosen for the new units.

For complete details on any type of water conditioning equipment, write: The Permutit Company, Dept. W-4, 50 W. 44th St., New York 36, or Permutit Company of Canada, Ltd., Toronto 1, Ont.

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Water Conditioning
Ion Exchange • Industrial Waste Treatment

Vol. 105 No. 4

April • 1958

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WATER & SEWAGE WORKS

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Frank J. Schwemler, Commissioner of Water
Consulting Engineers—Havens and Emerson
Prestressed Concrete pipe by Price Brothers

Cleveland...

...uses Pratt Valves in a tight spot

City installations, with limited clearances and traffic problems, are never easy. This Cleveland project, tying a new booster station into two distribution lines, is about as tough as they come.

Here the specifications could not call only for "dependable valves" . . . it had to be "*dependable valves that are easy to install.*" This is where the engineer and contractor can tap the benefits of Pratt's long experience . . . major features of Pratt Butterfly Valves include exactly those things that simplify difficult jobs: minimum head room, versatile operators that can be buried without vaults . . . and design and construction such that the valve will always be easy to open or close.

If you would like to know more about Pratt Butterfly Valves, 40 page manual B2B is yours for the asking. *Henry Pratt Co., 2222 S. Halsted St., Chicago 8, Ill.* Representatives in principal cities.

See us in booth 134 at the A.W.W.A. Convention in Dallas, Texas; April 20-25

HENRY PRATT

RUBBER SEAT Butterfly Valves

BRIEFS

Copies of the 1957 Index are still available and may be obtained by writing our editorial office, 155 E. 44th St., New York 17, N. Y.

In Dallas, Tex., planning has paid dividends in water supply development because it has been followed by action. Particularly the action of the last 12 years has been significant in both developing and implementing plans that will provide ample water to the year 2000. Inasmuch as Dallas is the host city for this year's AWWA Convention, it is fitting that the Dallas story be told by Superintendent of Water, Henry J. Graeser—page 127.

The Modern Well Driller must be an engineer, geologist, and jack-of-all-trades in the complex business of developing ground water supplies according to O. C. Lewis—page 136.

Yields of Impounding Reservoirs may be determined by several approaches, which are given by E. L. MacLeman—page 144.

Water Supply for municipal service has been receiving some public concern, which is an encouraging sign but it should receive more says John H. Murdoch, Jr.—page 150.

Slip-on Joint Pipe is being used by a number of water works utilities. The experiences with this joint at four utilities, its advantages, precautions to be followed, cost comparisons, etc., are recounted by Frank C. Amsbary—page 153.

Porous Plate Filter Bottoms, first installed in 1936 are now used in more than 400 cities, and are acceptable to a majority of consulting engineers. The application, design, installation, and materials of the filter bottoms are set forth by Frank C. Roe—page 157.

AWWA Board Action picks Finch for President, Grayson for Vice Pres., Orchard for Treasurer; also adds four honorary members, chooses annual awardees, sets policies on certification and reservoirs uses and creates a Public Information program—page 164.

AWWA Technical Program for the Dallas meeting lists 15 sessions and more than 50 separate topics and papers—page 168.

3-Way Control of Sludge Digesters utilizes the determination of CO_2, pH and volatile acids by Ira C. Kelley—page 170.

Sewer Use Regulations by municipal ordinance require careful consideration in the preparation of equitable controls for sewage and industrial wastes according to Don E. Bloodgood—page 172.

Modern Grit Handling involves the use of Hapman conveyors at the Jefferson County (Birmingham, Ala.) sewage treatment works. The equipment is described by Fred E. Stuart, Jr.—page 175.

Plastic Pipe with Steel Jacket (Jal-Jacket PVC) combines the strength of steel and chemical resistance of plastic; manufactured by Jones & Laughlin Steel Corp.

Prestressed Concrete Tanks Show Big Savings

Maintenance Costs Cut By 75%

Over a 50 year service life, a prestressed concrete tank will show a 75% saving in total maintenance costs over a steel tank of the same capacity. In today's economy, such a long range saving has tremendous appeal to municipalities and water companies throughout the world. When your tank requirements are in the planning stage, these calculated maintenance costs should be considered. Average yearly maintenance on a 3,000,000 gallon steel tank is estimated at $2500 per year at current prices. For a prestressed concrete tank, maintenance is negligible; however, occasional painting for color effect may be desired.

When the charges for servicing the initial cost plus relative maintenance allowances are plotted, the prestressed

concrete tank will often show a lower out of pocket cost to the owner in less than 5 years. When these costs and their increases are extended for an expected service life of 50 years, the savings to the owner with prestressed concrete are enormous.

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And, 75% of the contract price is spent right in your local community . . . construction is done with materials and labor available locally.

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Thos. F. Wolfe, Managing Director
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Cast Iron Pipe's record of maintaining high flow capacity throughout its long life is FACT not FICTION!

Carrying capacity without strength is like running a rickety car with a powerful engine . . . sooner or later it will shake apart.

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Specify America's #1 pipe and your water system will serve long after the bond issue is retired.

**Here is the proof!*

FLOW FACTORS FOR CEMENT LINED CAST IRON PIPE

LOCATION	SIZE	TEST SECT. IN FEET	VELOCITY F.P.S.	AGE YEARS	W & H "C" FACTOR
Bowling Green, Ohio	20"	45,592	0.7-2.4	New	142.5
Chicago, Illinois	36"	7,200	2.6-3.6	New	147
New Orleans, La.	12"	39,650	1.2-2.9	New	141
Corder, Mo.	8"	21,350	0.9-2.3	New	143
Univ. of Illinois	8"	400	3.14	New	150
Concord, New Hamp.	14"	500	1.7-2.2	New	151
Concord, New Hamp.	12"	500	2.0-3.4	11	142
West Palm Beach, Fla	12"	500	3.6-5.4	15	139.5
Greenville, S. C.	30"	87,376	2.4-2.7	12	148.5
Corpus Christi, Tex.	30"	65,641	1.1-1.8	6	146
Summerville, S. C.	8"	500	1.98-2.43	13	142.5
Champaign, Illinois	16"	3,920	3.1-5.6	22	139.3

*Available upon request: Booklet containing flow test and tables on Cast Iron Pipe.

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Most economical chlorinator for smaller water works, sewage plants. Safe, accurate, corrosion-resistant. Manual or semi-automatic. Capacities to 100 ppd.

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Whichever F & P Chlorinator suits your needs best, you'll find it the most up to date unit available. For it's made by the same F & P engineers who have been responsible for every major improvement in chlorinator design in the past five years. This same group brought the corrosion-proof, diaphragm regulator, flowmeter type chlorinator to reality.

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Instrumentation and Chlorination

See us at the A.W.W.A. Convention in Dallas—Booths 66-67

Equipment News

Plastic Pipe with Steel Jacket

401

Jones & Laughlin Steel Corp., Pittsburgh, Pa., has introduced a new type of pipe combining the strength of steel with the chemical resistance of plastic.

This product, to be marketed under the name of "Jal-Jacket," consists of a rigid polyvinyl chloride (PVC) tube which is jacketed with an electric resistance welded steel pipe.

Polyvinyl chloride plastic was chosen as the linear material because of its resistance to a broad range of corrosive fluids. By using a steel jacket, the limitation of pressure common to most plastic pipe is overcome and working pressures of 1000 psi at 150F are easily attained. Jal-Jacket is so designed that the pipe-ends as well as the inside surfaces are continuously protected. Positive seal and quick make-up are provided by the use of Victaulic couplings which lock into mill-rolled grooves.

The new steel-jacketed PVC pipe, which is being manufactured at the J&L Electricweld Tube Division plant at Oil City, Pa., will be available in 20-foot mill lengths in the 2 in., 3 in., and 4 in. sizes will be in production by the second quarter of 1958.

Turbo-Supercharged Opposed-Piston Diesel

402

Fairbanks, Morse & Co., Chicago, Ill., has announced a turbo-supercharged opposed-piston diesel engine, smallest and lightest commercial diesel in its horsepower range. Supercharging has added 50 per cent to the capacity of this rugged 2-cycle diesel, making it available in ratings up to 3,600 horsepower.

An added dividend achieved by the turbocharged OP is a 5 to 10 per cent saving in fuel consumption.

Turbocharging is available in the 6-cylinder and 12-cylinder configurations of the 8⅛ x 10-in. opposed-piston engine. The weight of the 6-cylinder basic engine is approximately 24,900 pounds, only 2,000 pounds more than the non-supercharged engine. The weight of the 12-cylinder unit is approximately 46,200 pounds, just 4,000 pounds more than the corresponding non-supercharged engine.

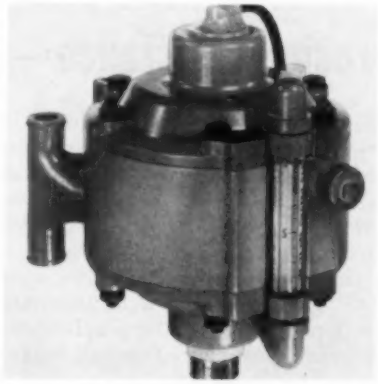
At its top rating of 3600 hp at 900 rpm, the 12-cylinder diesel weighs only 12.8 pounds per horsepower. Recommended speeds will vary, of course, with the application.

Space required for installation of the supercharged engine is virtually the same as for the non-supercharged unit since the turbochargers are mounted on the end of the engine and extend little beyond normal piping connections below.

Swimming Pool Chlorinator

403

Fischer & Porter, Hatboro, Pa., has



introduced an accurate, compact chlorinator designed especially for swimming pools. Although the new Super-C Chlorinator is small enough to hold

CONTINUED ON PAGE 11A

For Municipal Water
FLUORIDATION

You get three-way economy, safety and assurance of ample supplies with

INTERNATIONAL
HYDROFLUOSILICIC
ACID

Municipalities save three ways with *International Hydrofluosilicic Acid:* in cost of equipment installation, in operating cost and in cost of materials. Handling and control of liquid feed is simple and easy with a minimum of space needed for storage.

Liquid feed asures maximum safety for operating personnel.

International Hydrofluosilicic Acid is available for immediate delivery in tank truck and tank car deliveries.

Shipments are currently being made from plants at Mason City, Iowa; Chicago Heights, Illinois; Lockland (Cincinnati), Ohio; Buffalo, New York; East Point, Georgia; Hartsville and Spartanburg, South Carolina and Tupelo, Mississippi. Other shipping locations will soon be available.

With ample raw materials and large production facilities, *International* can provide municipalities with a dependable source of supply today and in the years ahead.

International Hydrofluosilicic Acid runs typically 23% to 25% H_2SiF_6.

If you are fluoridating now or planning to do so soon, it will pay you to talk with *International's* representative about the use, handling and costs of *Hydrofluosilicic Acid*. Please write or phone the office near you.

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485 Lexington Ave., New York 17
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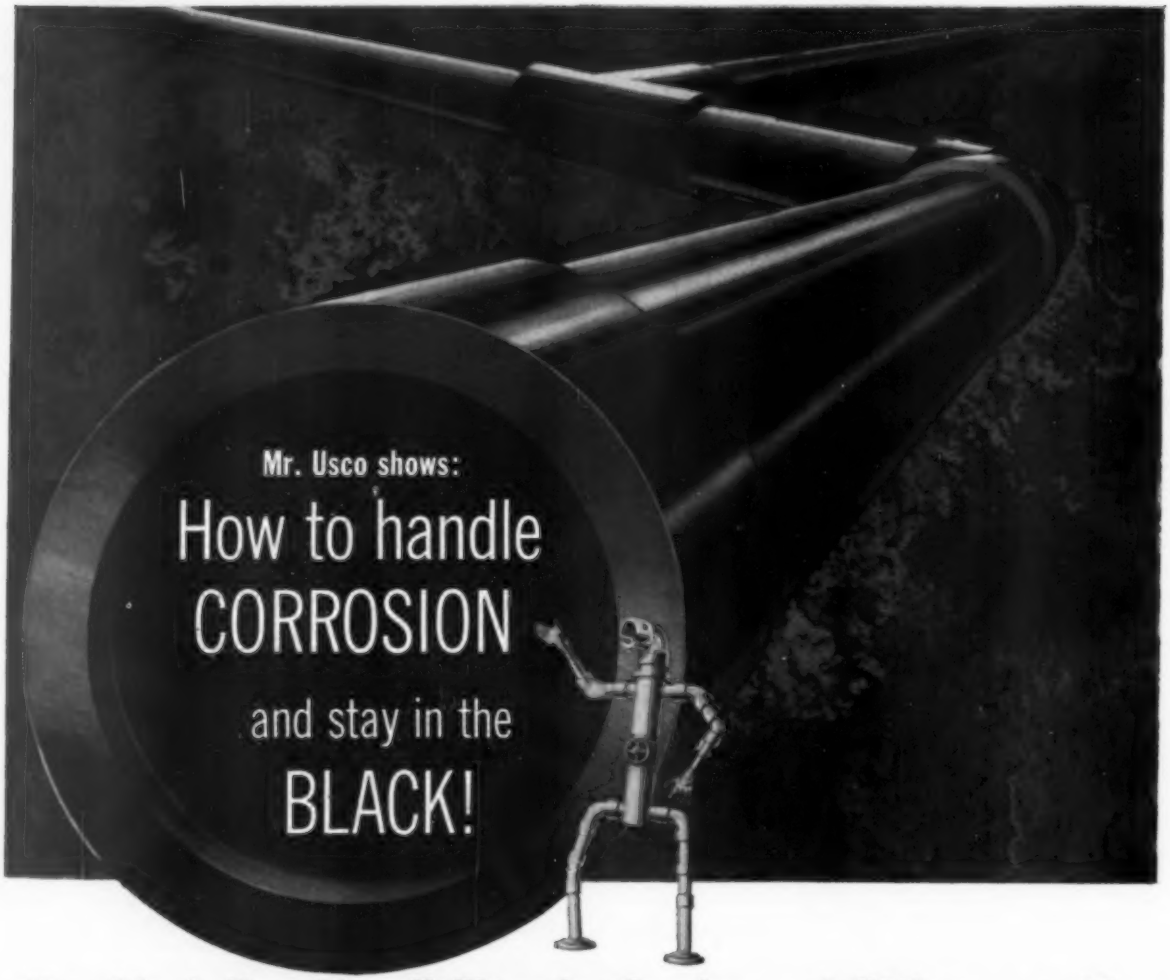
US RUBBER USCOFLOW PLASTIC PIPE



New black UscoFlow Utility plastic pipe and fittings provide economical corrosion resistance—inside and out

A blend of styrene-base resins and synthetic rubber to give good impact resistance and high, effective tensile strength...

A simple installation—rapidly solvent welded...

A friction-free finish that maintains high flow-rate and resists build-up of scale or other deposits...

An economical price to solve corrosion and high installation cost problems that would ordinarily chew into your profits...

All this is the *new* UscoFlow line of black plastic pipe and fittings, specially designed for economical and efficient handling of fluids. It has already proven its long service life, free of maintenance and downtime, and is recommended for such applications as

salt-water lines **fresh-water lines***
natural-gas lines **electrical conduit**

A full selection of UscoFlow pipe and fittings—plus expert engineering assistance—is available at any of the selected "U. S." Distributors, at "U. S." Branch Offices, or by contacting us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

**Uscolite is approved by the National Sanitation Foundation for use with potable water.*

US RUBBER Mechanical Goods Division
United States Rubber

See things you never saw before. Visit U. S. Rubber's new Exhibit Hall, Rockefeller Center, N. Y.

Equipment News

CONTINUED FROM PAGE 9A

in the palm of the hand, it provides the same quality protection provided by the larger units.

Equipped with a direct reading flowmeter, it meters up to 50 ppd of chlorine over a full 10:1 range. Maximum capacities of 10 or 25 ppd may be secured in minutes by substituting another flow tube. The unit is mounted directly onto the wall, tank, or pipe stand simply by drilling four holes. No panel is required. The Super-C Chlorinator is designed to give accurate, trouble-free service without maintenance, yet costs only about half the price of similar quality units.

All Transistor Pipe Finder—Leak Detector

404

Fisher Research Laboratory, Inc., Palo Alto, Calif., has announced a new transistorized M-Scope Combination Pipe Finder—Leak Detector. Developed after 12 months of laboratory research and field testing, this new detector combines all the advantages available through new electronic techniques and materials. Transistors,

printed circuits, indestructible Fiberglas cases, and single turn solid aluminum detecting loops are just a few of the new materials used. Conven-

CONTINUED ON PAGE 13A

NEED FITTINGS IN A HURRY?

You Get Complete Selection and Fast Delivery from Kuhns!

This partial view of our warehouse gives you an idea of the stock we maintain in order to meet your most urgent needs for pipe fittings of any type.

Kuhns cast iron or ductile iron fittings are available coated with a special rust proofing compound, galvanized, or coated to meet your local specifications. Over 3000 sizes and shapes.

Sizes Available

Flanged fittings, all types in sizes from 1½" through 12". Companion flanges; from 1" through 12". Screwed fittings; from ¼" through 12". Every Kuhns fitting is backed with the finest workmanship and strictest quality control that assures you of sharp threads, chamfered edges and perfect sealing. "K" fittings need no "babying"—they'll save time and last longer!

$200 in Pipe Fittings...Free!

In connection with the current "Big Push" contest on remodeling, The Kuhns Brothers Co. is contributing $200 worth of assorted pipe fittings to the list of prizes. This prize of high quality fittings is worth winning!

Kuhns fittings are available nationally through better wholesalers.

K

THE KUHNS BROTHERS CO.
1800 McCALL STREET • DAYTON, OHIO
1887 • 70 years of Continuous Progress • 1957

34,000 reasons why St. Cloud depends on Bailey!

. . . . **Serving a population of** 34,000 Minnesotans requires up to 9,000,000 gallons of water per day. Controlling and recording the operation of St. Cloud's six filtering beds are six Bailey Filter Operating Consoles. This modern water treatment plant went into service in February, 1957.

Engineers: Consoer, Townsend & Associates
Mechanical Contractor: George A. Bass Construction Co.

Keeping pace with the ever-increasing demands for water to supply population growth and industrial expansion, is no easy job.

But more and more cities are proving equal to the task by adopting newer, more economical and more scientific methods of water handling. And to simplify the complete operation, they are installing Bailey Instrument and Control Systems. Because Bailey can furnish *complete* control systems . . . made up of *standardized* components . . . that not only do a better job, but can easily be expanded to meet future needs.

Engineers, water superintendents and city officials themselves will tell you that Bailey telemetering and control systems are outstandingly reliable and economical, attractive, and easy to maintain.

Ask your qualified Bailey Engineer to help you plan your water works expansion program.

W-4

WATER & WASTE TREATMENT DIVISION

BAILEY METER COMPANY

1071 IVANHOE ROAD • CLEVELAND 10, OHIO

In Canada—Bailey Meter Company Limited, Montreal

BAILEY METERS

Equipment News

CONTINUED FROM PAGE 11A

tional pipe finder maintenance problems are completely eliminated.

Transistors, in addition to their many other advantages for field detectors, provide exceptional battery economy. The battery life in this new unit is estimated to be 1500 hours of continuous operation. This means a battery life in excess of one year of normal field use between battery changes. Battery operating cost is less than 1c per day. There is only one battery in each unit. Other new features include simplified operation procedure, built-in battery testers, power selection control, detachable carrying belt, complete illustrated instructions.

Flowmeter Offers Snap-In Construction

405

Fischer & Porter Co., Hatboro, Pa., has announced a new 2700 series Vari-

able-Area Flowmeters that feature packing-less, snap-in metering tubes. By using O-Rings to seal the tube ends to the metal fittings—nuts, bolts, stuffing boxes, packing glands and all adjustments have been eliminated. Piping strains cannot be transmitted to the glass metering tube since the tube "floats" in the O-rings. Side frames and front and rear covers are also of snap-in construction.

The new design permits coverage of flow ranges from a fraction of a cc/min to 40 gal/min with only three meter sizes. Formerly eight sizes were required. Metering tubes can be "snapped-in" without the use of any tools and without disconnecting or disassembling the meter. Cleaning and range changing are reduced to simple, quick routines. All dimensions conforms to standards of ISA Recommended Practices (P.R. 16.1—Tentative).

One-Man Trencher

406

The Arps Corporation, New Holstein, Wis., has announced the development of a new, one-man operated trencher. Called the Arps Trench-Devil, Model Jr., the compact new trencher is ideal for gas or water line trenching, electric cable installations, telephone installations, lawn sprinkler systems, and similar light trenching jobs. One man can transport the Trench-Devil to the job site, easily unload it from a truck, complete the work at hand, and load the unit unaided. The Trench-Devil digs a trench 2¾" wide, up to 20" deep. At the 20" depth digging speed averages 6' per minute; a 12" depth increases digging speed to 15' a minute.

Acid Proof Treatment

407

Hallemite Mfg. Co., Cleveland, Ohio, has developed Amazite, a pure plastic resin, that may be applied right over new or old concrete, terrazzo, brick, stone, marble, slate, plaster, metal or wood. This new product is said to provide both complete protection for floors, walls, ceilings, fixtures and equipment against destructive acids and caustics, as well as rugged resistance to abrasion.

Thick applications may be trowelled on to transform rough, pitted floors into smooth traffic areas. Surfaces in good condition may be protected and preserved by brushing on the treatment like a paint.

Amazite hardens overnight into a

CONTINUED ON PAGE 21A

Simple-Low Cost-Reliable

60 YEARS AHEAD

Compact ejector system, motor compressor assembly and all controls in one "packaged" unit. Also made in twin units.

BLACKBURN-SMITH
Sewage ejectors

Lowest in installation, operation, maintenance costs. Greatest efficiency and sanitation. No complex piping, screens, impellers, shredders, etc. Discharges sewage at rate of 30 to 500 g.p.m., heads up to 150 ft. Hundreds in use, everywhere. Backed by 60 years of experience.

WRITE FOR CATALOG S-55

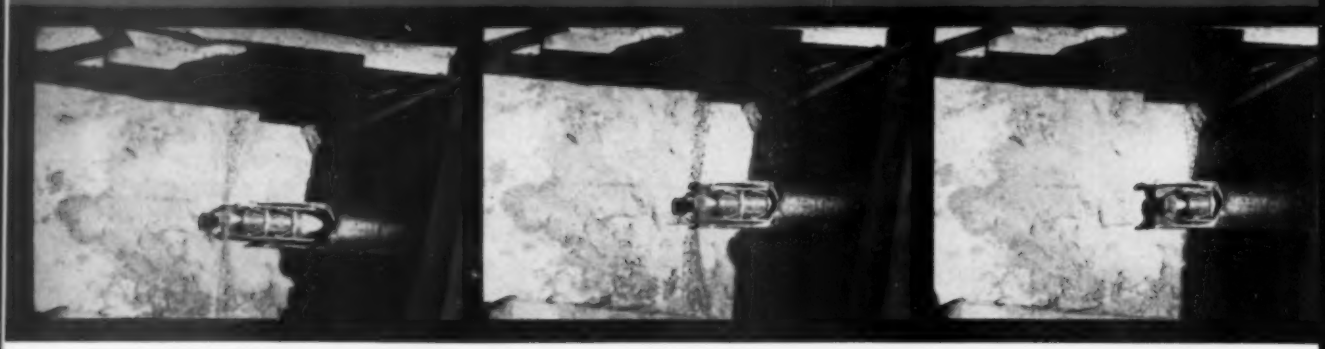
Shows application, advantages, dimensions and layouts of B-S Pneumatic Sewage Ejectors, single and duplex units. Describes exclusive features of float, electric and pneumatic controls. Tells how to select proper size ejector.

BLACKBURN-SMITH MFG. CO., INC.
51 GARDEN ST., HOBOKEN, N. J.
Oldfield 9-4425
N. Y. Tel., BArclay 7-0600

Announcing the most revolutionary development

NOW! THE CENTRILINE PROCESS

THE
CENTRILINE MACHINE
designed for 6" to 14" mains

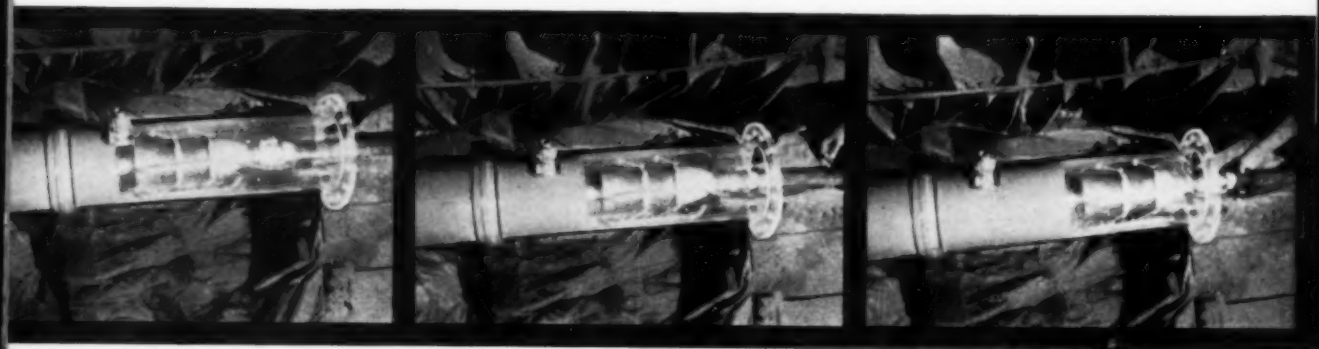


SEE THE NEW CENTRILINE MACHINE AND ITS PIPE LINING

AT BOOTHS 120 AND 121 · A. W. W. A. CONVENTION, DALLAS!

in the water works field in the past 15 years!

is also available for 6″ to 14″ mains



Cross section view, in special transparent pipe, showing new machine in action being pulled from left to right.

NOW, for the first time, your city's small but important transmission and distribution lines, including those used for fire protection, can regain their original flow capacity and pressure through the famous Centriline Process. A smaller version of the Centriline machine has been developed for use in 6″ to 14″ mains.

Here is how Centriline rehabilitates water systems' distribution grids. First, the pipes are cleaned to remove all tubercules, scale and loose materials resulting from corrosion. The Centriline machine is placed in the pipe and mortar is forced into a rapidly revolving head which applies a uniform coating on the pipe wall by centrifugal force. The thickness of the lining can be regulated by careful control of the machine. All of this is accomplished with a minimum of interruption to surface traffic, since the pipes are lined in place!

The advantages of using the new, small diameter Centriline machine in your mains are numerous. The new machine has a design feature which eliminates most excavations at valves, laterals and corporation cocks. The cost is lower than ever before. In addition, Centrilining permanently prevents future tuberculation, corrosion or leakage . . . reduces maintenance and pumping costs . . . raises distribution pressures and efficiency and extends the life of steel or cast iron pipe indefinitely. Send today for your free copy of our illustrated booklet which fully describes how Centriline can help you salvage worn out water lines of every size.

View of machine at work in special cut away pipe illustrating centrifugal application of cement-mortar.

CENTRILINE CORPORATION

A Subsidiary of Raymond Concrete Pile Company

140 Cedar Street
New York 6, N.Y.
WOrth 2-1429

Branch Offices in Principal Cities of the United States, Canada and Latin America

improving a superior product

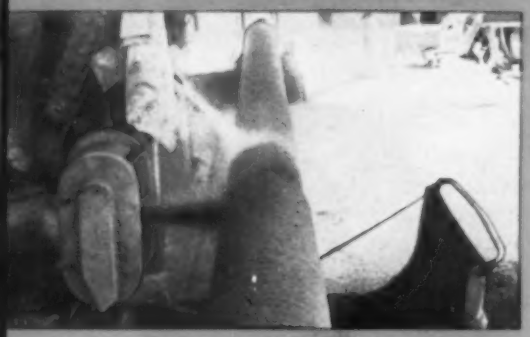
American Concrete Cylinder Pipe has long been established as one of the outstanding developments in the field of pressure transmission of water. This superior design combines the physical properties of steel with the structural and protective properties of concrete — producing a pipe of great strength and long life. Important transmission lines of American Concrete Cylinder Pipe are today serving most of the major cities and population centers in the western United States.

Through the years, continuing research has led to improved features in the manufacturing process. These features enrich the alkaline environment surrounding the steel components, which environment is so necessary to the continuing and everlasting protection that well-made concrete gives to this high quality pressure pipe.

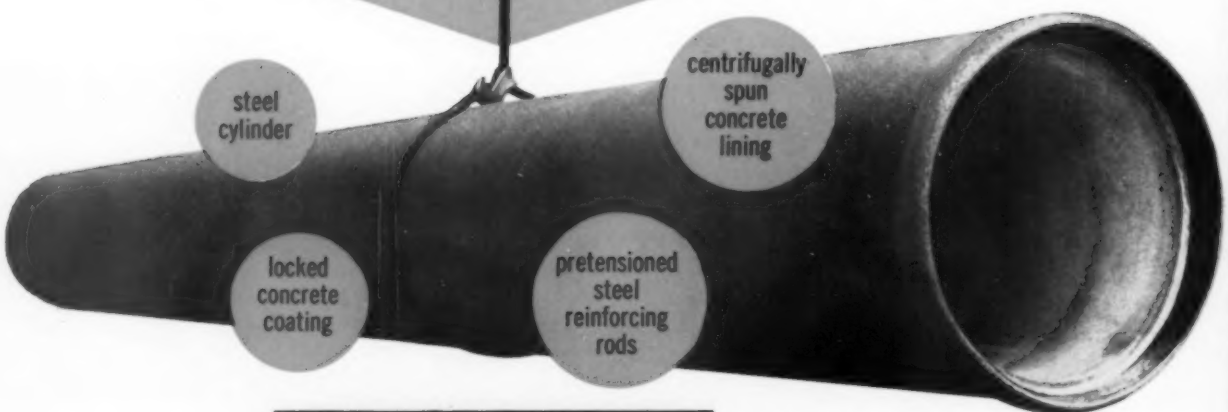
Specify these plus-factors featured by American — where research, development and quality control are always striving to make high quality products even better.

American Concrete Cylinder Pipe is available in a diameter range of 12" through 60" I.D. and in standard lengths of 32 feet.

Rich cement wash applied to steel reinforcing rod just before it is wound under measured tension and with accurate spacing around concrete lined cylinder provides positive assurance of a highly alkaline environment between surfaces of cylinder and circumferential reinforcement.



An additional rich cement wash over the entire outer surface of the pretensioned steel cylinder before application of the pipe's dense mortar coating assures maximum alkaline environment where it is most needed.



American PIPE AND CONSTRUCTION CO.

Los Angeles: 4635 Firestone Blvd., South Gate, Calif., LOrain 4-2511

Hayward: P.O. Box 630—JEfferson 7-2072

San Diego: P.O. Box 13—CYpress 6-6166

Phoenix: 2025 South 7th St.—ALpine 2-1413

Portland: 518 N.E. Columbia Blvd.—BUtler 5-2531

News—Here & There

Correction—Jan. Issue, p. 84

Prof. Philip Morgan of the State University of Iowa writes, "On page 84 of the Feb. issue of *Water & Sewage Works*, I was misquoted so that it would appear that I made an uncomplimentary remark about the operation of the Los Angeles Sewage Treatment Plant. My comments were actually the opposite. While discussing the difference between thermophilic and mesophilic temperatures, at the Ind. Sew. & Industrial Waste Assn, I commented on the successful operation of the Los Angeles digesters at thermophilic temperatures, but indicated that others had experienced difficulty when operating at the higher temperatures. Then I described some laboratory studies which I had conducted at Kalamazoo, Mich. where I had experienced severe odor problems with digestion of paper mill waste at thermophilic temperatures. Unfortunately, the quotation makes it appear as though the difficulties I experienced at Kalamazoo were being encountered at Los Angeles. This is certainly unfair to their excellent operating staff."

Robert M. Pope

has been appointed Chief Civil Engineer of Guy B. Panero Engineers after 18 months in the Middle East. He will direct the firm's civil engineering group. A specialist in water supply and sewage treatment, Mr. Pope recently completed an assignment as project manager of a $66 million public works development program for the government of Iran.

A graduate civil engineer of the University of New Hampshire with an M.S. in Sanitary Engineering from Harvard, Mr. Pope has previously been associated with Malcolm Pirnie Engineers, Francis Engineering Co., Weston and Sampson, and the American Cyanamid Co.

Penna. Sewage Operators Honored

at the meeting of the Eastern Pennsylvania Sewage and Industrial Wastes Operators Assn. framed certificates attesting the years of service were presented to George Boone, Supt. of Sewage Treatment at Norristown, Pa., J. Haines Shertzer, City Engineer, Lancaster, Pa., and Eugene B. Swinehart, Retired, formerly Superintendent at Pottstown, Pa.

Frank L. Flood

died on Feb. 14 at his home in Needham, Mass., after a recurring illness with which he was stricken last summer. Mr. Flood had been a partner in the Boston Consulting Engineering firm of Metcalf & Eddy, since 1942; he joined the firm in 1942 as an assistant engineer. He was a specialist for the firm in sewage treatment and sewage treatment plant equipment. One series of articles by Mr. Flood on sewage works equipment ran in *Water & Sewage Works* some years ago, and was reprinted in the Reference & Data Number.

Mr. Flood was a graduate Civil Engineer from Northeastern University in Boston. He served in World War I and began his professional career with the Mass. Dept. of Health before he joined the firm of Metcalf & Eddy. In World War II he was Chief. Sanitary Engng. Sect., U. S. Army, 1st Service Command.

In addition to writing many articles, Mr. Flood was active in several professional organizations including the ASCE, AWWA, NEWWA, NESIWA, FSIWA and the Boston Society of Civil Engineers of which he was a past president. He had been a member of the Board of Directors of FSIWA and a President of NESIWA and was a member of the 1958 Program Committee of the Federation. At the time of his death, he was 60 years old.

Engineering Your Health

is the title of a new film available for distribution from the Public Health Service. The film, in sound and color, will run 13.5 minutes; it has been produced by a commercial firm, and is devoted to sanitary engineering as a desirable professional career.

The film is especially aimed at freshmen and sophomore college engineers, but it should be equally attractive to high school students interested in science. According to the U. S. PHS the film is "Incentive-motivation oriented rather than instructional or how-to-do-it oriented." Accompanying each reel will be a question and answer brochure. This booklet has been prepared so that an adult who is not a sanitary engineer, can brief himself and then show the film with some ability to carry on intelligent discussion periods about occupational choice.

The film may be borrowed, rent free, from DHEW Regional Offices or from Public Inquiries, Public Health Service, Washington 25, D. C.

Research Assistantships Are Available

at the State College of Washington for persons interested in studying for the master's degree in sanitary engineering. For information, write to E. B. Moore, Chairman, Department of Civil Engineering, State College of Washington, Pullman, Wash.

North Carolina Offers Doctorate

in Sanitary Engineering with the inauguration of a new course of study in the Department of Sanitary Engineering of the School of Public Health. A master's degree program has been offered at UNC since 1920. Candidates for the Doctor of Philosophy degree must have completed a master's degree program in Sanitary Engineering, Sanitary Science, or Sanitary Chemistry and Biology.

The major fields of study include water supply and treatment, waste treatment and disposal, environmental sanitation, and atmospheric pollution control.

Graduate teaching and research assistantships and research associateships, and fellowships are available to qualified students. Information may be obtained from the Dept. of San. Eng., P. O. Box 899, Chapel Hill, N. C.

News—Here & There (continued)

Francis J. Downing, Buffalo's Public Works Comm.
brings to him the overall responsibility for the water department of Buffalo. He has previously served the City of Buffalo as Superintendent of Sewers and later as General Manager of the Buffalo Sewer Authority.

Miami Water & Sewer Department
was cited for "achievement in accident prevention" in the fiscal year 1956-57. Three plaques and 293 individual citations and pins were presented by the Bituminous Casualty Co., of Rock Island, Ill. which also returned $4,524 to the city on Workmen's Compensation premiums. Shown here receiving the plaque for the executive and general offices of the department is C. F. Wertz, Director of the Department. The presentation was made by James F. Fulton, Safety Engineer of the Bituminous Casualty Co.

Public Health Service Offers Guidance
for secondary school students in a new comprehensive vocation guidance booklet devoted exclusively to sanitary engineering. Titled "Toward a Healthier World: Your Career in Sanitary Engineering," this brochure is multi-colored, illustrated interestingly, and is written in simple direct language for interested secondary school students.

The booklet may be obtained from the Dept. of Health, Education, and Welfare Regional Offices, or from the Public Inquiries, Public Health Service, Washington 25, D. C.

Coagulant Aids Are Not Harmful
to water consumers, when these aids are used in the recommended concentrations, and provided the quality specifications continue to be met. This conclusion was reached by the Technical Advisory Committee on Coagulant Aids for Water Treatment based on information submitted by the manufacturers to the committee.

This committee was established at the request of the Secretary of the Amer. Water Works Assn. following numerous inquiries from health agencies, for the purpose of advising the Public Health Service as to the safety of various coagulant aids offered for use in public water supply treatment.

The committee emphasized that its findings bear only on the health aspects of the use of these products and do not constitute an endorsement of any product, nor do they indicate the effectiveness of the proposed use. The coagulant aids reviewed included: Hagan Coagulant Aids #7, #11, and #18, manufactured by Hagan Chemicals & Controls, Inc.; Jaguar produced by Stein, Hall & Co., Inc., Permutit #65, #66, #67, made by the Permutit Co.; "Drewfloc" produced by E. F. Drew & Co., Inc.; and Carboxymethylcellulose made by the Hercules Powder Co., Inc.

Members of this special committee include: Dr. Herbert E. Stokinger, U. S. PHS, Chairman; Dr. A. P. Black, University of Florida; Dr. David W. Fassett, Eastman Kodak Co.; Paul D. Haney, Black & Veatch, Cons. Engrs.; Dr. Robert A. Kehoe, Kettering Laboratory; and Dr. Richard L. Woodward, PHS, Secretary.

Interstate Sanitation Commission
annual report to the Governors and Legislatures of the States of New York, New Jersey and Connecticut has been presented by Seth G. Hess, Director and Chief Engineer.

The report lists progress in the control of pollution of New York Harbor and adjacent waters. Projects costing more than $85 million were completed by the construction of works to treat raw sewage now going into the District waters as well as providing improved facilities at some of the treatment plants in the area. Unexpected population growths in certain areas has overloaded plants requiring enlargement of local facilities.

The report records a consent order upon the City of New York amending the Commission's original order, with the result that the amended order now fixes a construction schedule to be concluded in 1967.

Sanitary Service Charges in Tennessee
is now available in its 6th edition. The basic purpose of this publication is to provide up-to-date information on water, sewage, and refuse collection service charges currently in effect in Tennessee communities.

In addition the report contains general information and recommendations for establishing valid rates and charges for sanitary services in communities which are dissatisfied with their existing rates or which are establishing rates for the first time.

University of Colorado Short School
held at the Denver Extension Center drew more than 100 water and sewage plant operators. Nearly fifty per cent of the registrants for the five day school were new to the school this year. Six operators came from Wyoming, one from Utah and the rest from Colorado communities.

Topics presented included plant maintenance, algae problems, prevention of contamination, chemistry, arithmetic, flow problems and bacteriology.

Co-sponsors with the University of Colorado are the Rocky Mountain Sect. of AWWA, Colo. Dept. of Health, Colo. Municipal League, Rocky Mtn. Sew. Wks. Assn., U. S. PHS, and the Wyoming Dept. of Health.

P. H. McGauhey Appointed
Director of Sanitary Engineering Research Project at the University of California. Official confirmation was only recently made but he has been acting in that capacity since July 1, 1957.

Another development at U. of C. which strengthens the research program was the creation of a statewide Water Resources Center within the University last October. Prof. Martin B. Huberty, Prof. of Irrigation and Engineering at the Los Angeles Campus was appointed Director of the Water Resources Center.

You can run a Rockwell Sealed Register Meter

UNDER WATER...

You Can Run This Sealed Register Meter

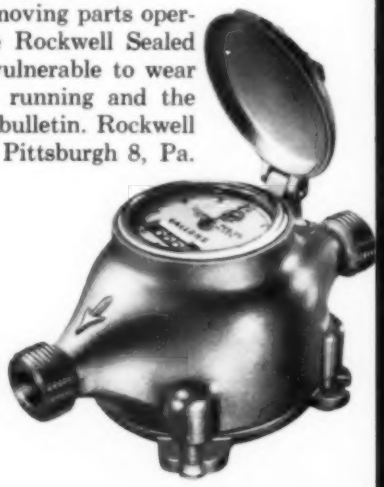
UNDER WATER!

You who have had meters stopped and registers ruined in flooded basements or curb boxes know what it means in trouble and expense. The Rockwell Sealed Register water meter forever ends that problem. Water, muck and grime just can't get into the hermetically sealed register.

Too, you can always read this new Rockwell meter. Condensation, which so frequently mists and obscures the dial face of conventional meters, can't occur with this sealed construction.

In the matter of maintenance, with Rockwell Sealed Register meters you'll never again need to service leaky or bound stuffing boxes—*for there are none!* A powerful magnetic coupling between the measuring chamber and the sealed register positively transmits motion without mechanical linkage or seal.

All this, plus only two moving parts operating in water, make the Rockwell Sealed Register meter the least vulnerable to wear or attack—the smoothest running and the most accurate. Write for bulletin. Rockwell Manufacturing Company, Pittsburgh 8, Pa.



Rockwell Research leads the way

with the Sealed Register Meter

The remarkable all-new Sealed Register meter resulted from the combined talents of over 200 skilled Rockwell engineers and technicians. Their work was conducted in the most modern and advanced facilities in the meter industry.

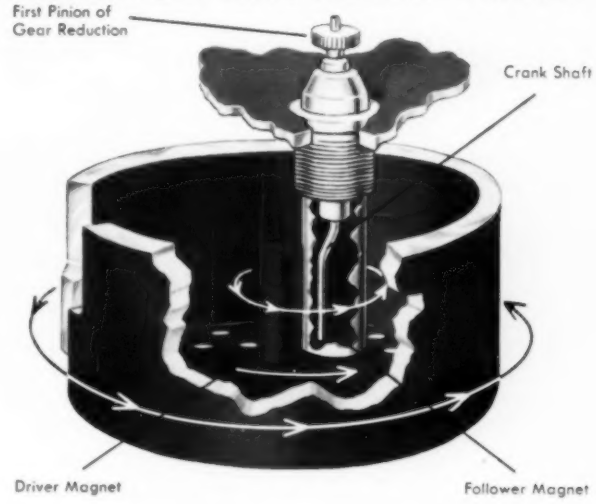
Since the introduction of this meter, one short year ago, water meter history has been re-written. *Your* acceptance of the principles involved and *your* orders from all over the country have demonstrated that a better meter was needed and welcomed.

Just in case you have forgotten, the two important engineering advances which made the Rockwell Sealed Register meter possible are described below.

HERMETICALLY SEALED REGISTER

This sealed register assembly contains all the gearing both for register operation and for intermediate reduction. Gears and pinions are of the free-running instrument type. They offer only token resistance to the measuring element and so improve the accuracy and response of the meter, especially on low flows. This hermetically sealed register construction is located high and dry above the flowing stream. It forever puts an end to condensation problems. There can be no fogging or clouding of the heat treated register glass. With all gearing sealed against corrosion and abrasion, the life expectancy of this unit is almost limitless. It is fully guaranteed for five years.

POWERFUL MAGNETIC DRIVE



In the Rockwell Sealed Register meter a powerful, permanent magnetic coupling is used to transmit motion of the measuring element directly to the register without a mechanical connection. The driver magnet is within the center shaft of the measuring piston. The follower is encased in a watertight housing which extends into the center of the measuring chamber. As the piston oscillates, the driver magnet revolves around the follower. The follower pushes a crank shaped shaft so that the crank transmits every movement of the driver. This crank then drives the first pinion of the gear reduction in the sealed register case.

The Alnico alloy used in this magnetic coupling is a complex alloy, especially developed for this service. Laboratory control assures its consistency for a lifetime of efficient operation.

Readings stay accurate, revenue high because a *magnetic shield* positively eliminates "cheating" the magnetic drive.

SEALED REGISTER METERS

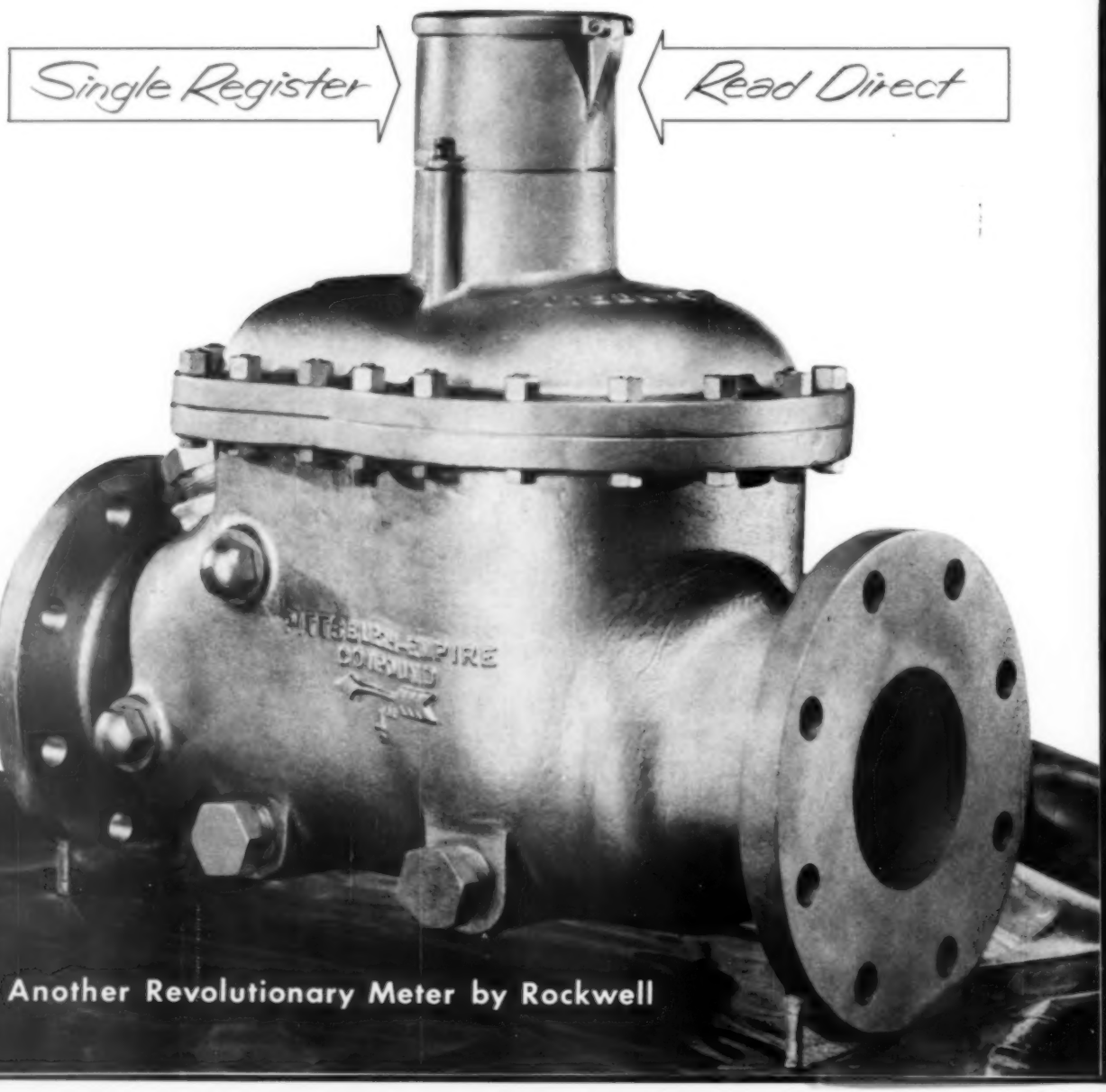
another fine product by

ROCKWELL

Rockwell *Single Register* Compound Meters

FASTER READING . . . FEWER ERRORS . . . NO CALCULATIONS

No other compound meter offers as many *conveniences and advantages* to the operating man. Consider the single register which speeds meter reading and prevents errors. Compare the light weight of these meters . . . the handling ease . . . against conventional compounds. Try and match the full range accuracy, the low pressure absorption, the smooth, quiet operation. And don't overlook maintenance ease. This Rockwell compound can be quickly dismantled or assembled while in the line. Bulletin W-803 gives complete details. Write for it today. Rockwell Manufacturing Company, Pittsburgh 8, Pa.



Equipment News

CONTINUED FROM PAGE 13A

dense, dustless, leather-tough film that does not chip even when "feathered." Under heavy traffic, ⅛ inch of Amazite outwears 2 inches of concrete.

Depending upon his own choice, the user can produce a finish either as glossy as a china plate or completely skidproof — even if wet, greasy or soapy.

Three formulations — for trowel, paint brush or sray gun application —are available in clear tile red and cement gray colors.

Pocket pH Meter

408

Beckman/Scientific Instruments Division, Fullerton, Calif., has announced that many department of health and city sanitation problems in controlling pH are now easily handled on-the-spot with a Beckman Pocket pH Meter.

This handy pocket meter is ideal for pH checking of lake and stream

pollution, water supplies, sewage disposal units and monitoring permanent pH systems.

Anyone can use this lightweight hand-size instrument after reading brief simple instructions on back of case. The unique feature of the Pocket pH Meter is the combination glass and

CONTINUED ON PAGE 23A

Where water is used, process equipment and storage tanks are sure to corrode unless protected by an E.R.P. cathodic protection system. Even with these concrete high rate clarifiers at the St. Regis Paper Company plant near Jacksonville, Florida, it pays to protect the metal parts with an E.R.P. cathodic system.

Engineering PLUS...

E.R.P. cathodic protection pays off in maintenance savings

In industry or public service, water treatment is a big investment. To protect that investment in water treatment equipment could be a tremendous maintenance job. Even with concrete clarifiers, it pays to use E.R.P. cathodic protection. When there are metal tanks involved, just one cleaning and painting can cost more than a complete E.R.P. cathodic protection system.

From preliminary design to continuing periodic corrosion surveys, experienced corrosion engineers measure, analyze and design specifically for your corrosion problems. That is the only way corrosion can be virtually eliminated.

E.R.P. engineering plus prevents corrosion of water storage tanks, water and sewage treatment structures and pipelines. For full information on how E.R.P. can help you save maintenance costs, write for bulletin E-46.00.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

W&T DRY CHEMICAL FEEDERS

For Accurate Feeding Of Water Treatment Chemicals

Full line of wide range dry chemical feeders capable of controlling a few ounces to 3000 lbs. per minute.

Write for Bulletin M-38 for complete Dry Feeder information.

WALLACE & TIERNAN INCORPORATED
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

COSTS LESS TO BUY

A single, molded rubber gasket is the only accessory required. There are no bolts, no nuts, no followers, no couplings, no extras.

COSTS LESS TO INSTALL

Assembly is easy and rapid. Rate of installation usually is limited only by the speed of excavating the trench.

JOINT IS TIGHT

Bell-Tite forms a pressure-tight joint instantly. Restrained joint bursting tests prove joint stronger than the pipe itself.

This is it...

CLOW Bell-Tite® Joint Cast Iron Pipe

ALL-WEATHER JOINT

You keep your schedules with Bell-Tite Joint cast iron pipe. It can be easily laid in a wet trench or even under water.

UNDERWRITERS' LISTED

All diameters through 24" listed and inspected by Underwriters' Laboratories, Inc. for working pressures to 350 psi.

AMPLE DEFLECTION

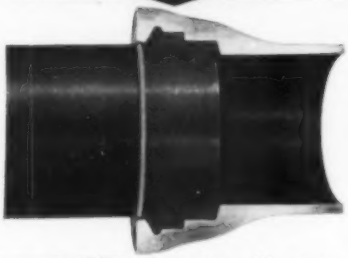
Bell-Tite Joint cast iron pipe is so designed that it will easily accommodate casual curves and normal grades.

MEETS ALL REQUIREMENTS

CLOW Bell-Tite Joint pipe is strong, tough, uniform and durable cast iron pipe for long-life underground service.

ANY SIZE OR THICKNESS

Available in any specified thickness or weight class in accordance with ASA, AWWA or Federal specifications. 3" to 24".



CLOW Bell-Tite Joint is easily assembled—Just wipe clean, lubricate and push spigot into the bell. When painted yellow stripe is no longer visible, joint is bottle tight.

ENTHUSIASTIC RECEPTION

Contractors and Municipalities—men who know pipe—have installed well over 1,000,000 feet of CLOW Bell-Tite pipe.

CLOW 1878 ®

JAMES B. CLOW & SONS, Inc.

201-299 North Talman Avenue, Chicago 80, Illinois

Subsidiaries:
Eddy Valve Company, Waterford, New York
Iowa Valve Company, Oskaloosa, Iowa

Equipment News

CONTINUED FROM PAGE 21A

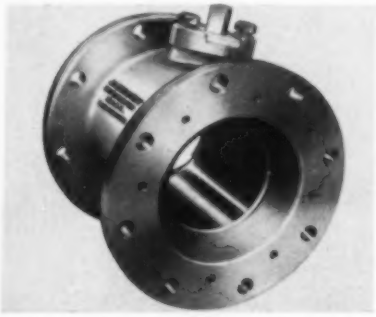
reference electrode with a convenient 36″ lead. This sensitive electrode may also be used while still clamped to the instrument's side—allowing the operator of a free hand to make notations.

The meter is 6″ long, 3″ wide, 2″ deep and weighs only 2 lbs. Measurements in the range of 2 to 12 pH are possible with readability of .1 pH. The seldom encountered lower pH values can be measured by a single adjustment. Power is supplied by six, easily-replaced, standard-type batteries. The handsome two-tone gray case is made of tough acid-resistant melamine plastic and has a scratch-resistant polystyrene dial face.

Ball Valves

409

Jamesbury Corp., Worcester, Mass., has announced the addition of 6″ and 8″ "Double-Seal" Ball Valves to its product line. The Valves are available in Stainless Steel, Carbon Steel, Bronze or Aluminum; seats and seals in "Teflon" and synthetic rubbers to suit specific requirements.



The unique "unit body" construction of these valves eliminates the need for an exterior bonnet joint and gasket usually employed by the make-up of gate, globe, plug cock and diaphragm valves. Jamesbury "Double-Seal" Ball valves feature a one-quarter turn quick and positive shut-off. Hand lever or air operated, the torque is low over the complete pressure range, with full flow capacity and minimum friction loss. Seats and seals are interchangeable and readily replaceable, no lubrication ever being required.

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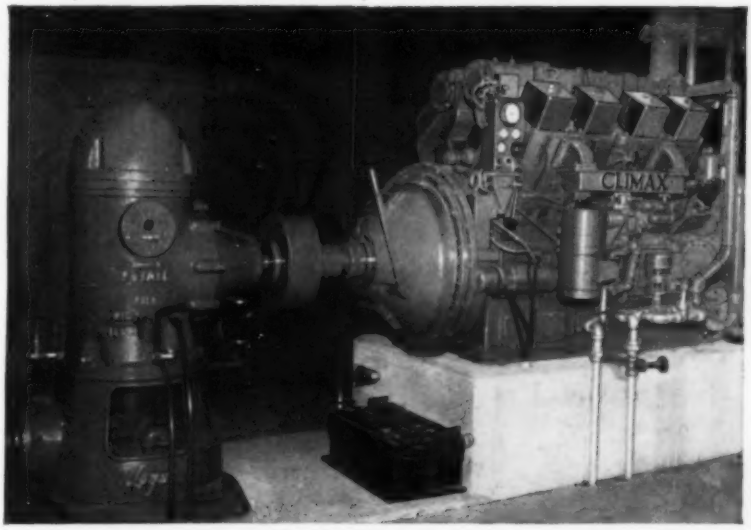


IMPORTANT FACTS ABOUT CLIMAX STANDBY ENGINES!!

CHOICE OF FUELS—
All models operate with equal efficiency on gas, butane or gasoline.

FAST, EASY STARTING—
Climax engines take over the complete load within seconds after normal utility power fails. If the starting system is manual, you merely press a button on the instrument panel...if automatic, the engine starts immediately.

SIMPLE TO OPERATE—
All instruments and controls are located at the sides of the engines . . . easy to read . . . easy to adjust.

SIMPLE TO MAINTAIN—
Accessories are within "arm's reach" to allow quick inspection and adjustment. Crankcases and engine bases have large hand holes on each side for easy access to all working parts.

SAFETY PROTECTED—
Safety devices are standard equipment on all models and automatically protect the engines against high water temperature and low oil pressure. An overspeed governor can also be furnished, if required.

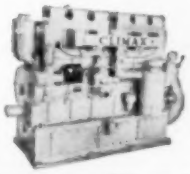
ACCESSORIES—
Various types of cooling and starting systems, mufflers, etc. are available to make each engine suitable for a particular application.

LONG ENGINE LIFE—
Climax engines are constructed of the finest metals, alloys and component parts available. Any model will give years of service if properly maintained.

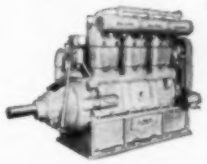
Write today for complete information, bulletins or engineering consultation

V-125—12 cylinder, 605 max. H.P. at 1200 R. P. M.
V-122—12 cylinder, 520 max. H.P. at 1200 R. P. M.

V-85—8 cylinder, 390 max. H.P. at 1200 R. P. M.
V-80—8 cylinder, 340 max. H.P. at 1200 R. P. M.



K-73—6 cylinder, 302 max. H.P. at 1200 R. P. M.
K-67—6 cylinder, 265 max. H.P. at 1200 R. P. M.

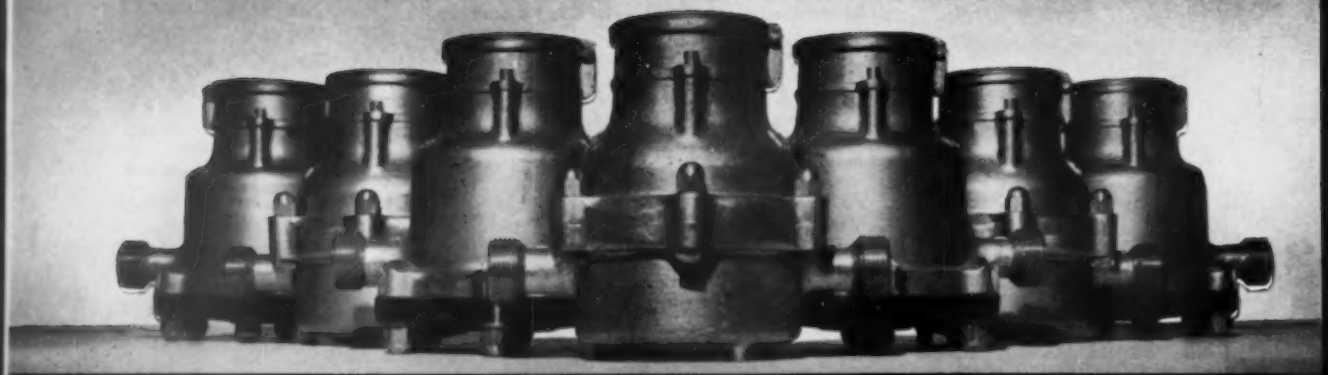


R-165—6 cylinder, 192 max. H.P. at 1200 R. P. M.

CLIMAX ENGINE MANUFACTURING CO.
DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY — CLINTON, IOWA

The best WATER METER you can buy

HERSEY



For information and literature on the most complete line of Water Meters, contact our nearest Branch or the Home Office

HERSEY MANUFACTURING COMPANY

DEDHAM, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS — CHICAGO
SAN FRANCISCO — LOS ANGELES

Equipment News

CONTINUED FROM PAGE 23A

New Type Wrought Iron

410

A. M. Byers Co., Pittsburgh, Pa., has developed a new 4-D Wrought Iron that is said to have superior resistance to corrosion over standard wrought iron.

The company stated that seventeen year in-service and laboratory tests have been conducted to compare new 4-D wrought iron not only with standard wrought iron, but with a number of other metals. The results of these tests have proved that new 4-D wrought iron has greatly superior resistance against many kinds of corrosive forces including those caused by severe industrial atmospheres, acid solutions, salt water, and steam condensates.

According to E. P. Best, Byers chief metallurgist, the improved 4-D wrought iron was achieved by substantially increasing the deoxidation of the base metal; increasing the phosphorous content in relation to the other material components; and using a more siliceous silicate fiberous material. Approximately 250,000 of these silicate fibers are evenly distributed throughout each cross sectional square inch of the metal.

A. S. Chalfant, V. P. sales, indicated that although production costs for new 4-D wrought iron would be increased, they would be absorbed by the company, and that the new product would sell for the same price.

Strip Chart Potentiometer

411

Westronics, Inc., Fort Worth, Tex., has a new 5" strip chart potentiometer recorder with plug-in range resistor features. The recorder is available with a variety of ranges for thermocouple, resistance bulb and linear millivolt spans.

The recorder also features a wide range of chart speeds from one inch per hour to two inches per second.

Total panel space required is 9⅝ in. by 8½ in. and the recorder weighs approximately 25 pounds.

CONTINUED ON PAGE 128A

GUNITE does it **2** times as fast at **½** the cost

"Gunite" is the modern process (sand and cement applied pneumatically) for repairing, constructing, lining:

- Reservoirs
- Dams
- Filter Plants
- Sewage Disposal Plants
- Tanks
- Stadiums
- Bridges
- Sea Walls
- Swimming Pools, etc.

WRITE FOR MORE INFORMATION, INCLUDING 48 PAGE "GUNITE" BOOKLET.

PRESSURE Concrete Co.

FLORENCE, ALA. 1555 Helton Street

OTHER OFFICES IN

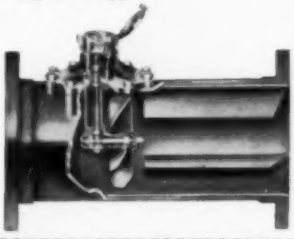
CHICAGO, ILL. 30 W. Washington Street

NEWARK 5, N. J. 193 Emmet Street

FLOW CAPACITIES AND MEASUREMENTS ARE *RELIABLE*, MORE *USEFUL* WITH . . .

The popularity and ever increasing use of Sparling propeller meters is obvious to the users. Negligible pressure loss and sustained accuracy insures proper determination of pump efficiency. Furthermore, due to the meter's design, there is minimum corrosion and mechanical wear. The standard lightweight and durable plastic propeller insures long bearing life and sustained accuracy. Be sure you get the complete Sparling story of *accurate, trouble free* water measurement. Write today.

New Masterflo Magnetic Type



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☐ Please send more information on Sparling Propeller Meters.

Name.....

Company.....

Address.....

City..... Zone..... State.....

Send to: SPARLING METER COMPANY
229 N. Temple City Blvd.
El Monte, California

easy

Tyton Joint® assembles so easily even untrained crews become expert in minutes. Only one accessory needed – a specially designed rubber gasket that fits into the bell of the receiving pipe. As the entering pipe slides in, it compresses the gasket to give a permanent, tight seal. No

U.S. cast iron PIPE FOR WATER, SEWERAGE AND

does it!

bell holes. No caulking equipment. No nuts or bolts to fasten. And no weather problems. Tyton Joint pipe can be laid in rain or wet trench if need be. Like to know more about the pipe joint that saves time, money and headaches from one end of the line to the other? Call or write today.

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

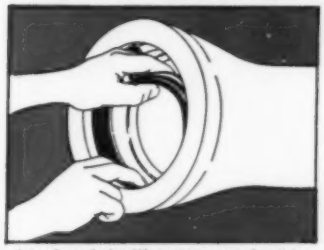
A WHOLLY INTEGRATED PRODUCER FROM MINES
AND BLAST FURNACES TO FINISHED PIPE

"SHECKS, WE DIDN'T NEED YORE MUSCLES, AUNT BEANY... A LI'L PUSH FROM ANY ONE OF US PUTS IT TOGETHER."

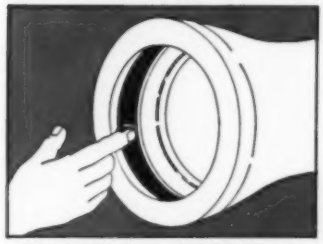
INDUSTRIAL SERVICE CAST IRON

U. S. TYTON JOINT

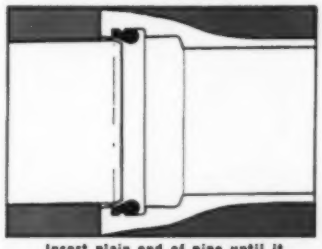
ONLY FOUR SIMPLE ACTIONS



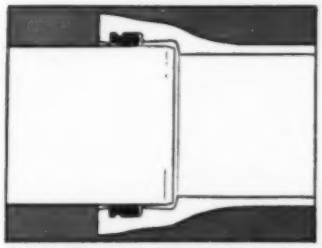
Insert gasket with groove over bead in gasket seat



Wipe a film of special lubricant over inside of gasket



Insert plain end of pipe until it contacts gasket



Force plain end to bottom of socket... the job's done!

8" Tyton Joint pipe for water main addition in Colorado.

RUGGEDNESS

Rugged power . . . dependability and durability . . . combined with precise pumping accuracy can mean only Precision Chemical Pump's new Model S. "Straight-line" engineering — the most basic design to give greatest pumping efficiency — features a motor integral with gear train. Both operate immersed in oil within a tough, one-piece aluminum casing. Heavy duty plastic tubing and valve housings plus corrosion-resistant valves and metal reinforced diaphragm assure longevity of solution handling parts.

As versatile as it is rugged, the "S" will pump with extreme accuracy virtually all water conditioning chemicals: from hypochlorites and soda ash to nitric acid and alum.

Available in multiple heads and for sulphuric acid, all pumps are covered by a one year guarantee.

For further information, write Dept. 2A, Precision Chemical Pump Corporation, 1396 Main Street, Waltham 54, Mass.

sewage treatment *corrosion control*
chlorination *fluoridation*

PRECISION CHEMICAL PUMP CORPORATION
1396 MAIN STREET • WALTHAM 54 • MASSACHUSETTS

New Bulletins *AVAILABLE FREE*

Small Package Sewage Plant

412

Dorr-Oliver, Inc., Stamford, Conn., has announced the availability of a new, eight-page, two-color bulletin entitled, "The Dorr-Oliver Completreator." This bulletin describes the compact design, operation and advantages of this new package-type unit for small plants. Also included in the bulletin, are a line drawing, flow diagram and a series of photographs showing the step-by-step installation of a unit.

Designed to provide a high degree of treatment for a maximum of 150 persons or their equivalent in waste solids and BOD, and according to the bulletin the Comple-Treator employs the Biofiltration process by combining five treatment steps in a single compact unit.

Induction Motors

413

Electric Machinery Mfg. Co., Minneapolis, Minn., has available new condensed, two-page product sheets describing their line of Squirrel Cage Induction Motors. Both horizontal and vertical types are illustrated. The sheets are three-hole punched to easily fit in the three-ring binder.

Described in detail are the types of construction including bearings, enclosures, and exclusive details on the E-M Squirrel Cage.

Ratings of the motors are from 60 through 4000 hp. Speeds vary between 450 rpm through 1800 rpm. The motors are of heavy-duty construction throughout.

Thermometers

414

Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., has released a catalog that describes the complete line of Brown rectangular case filled system thermometers. These indicators, recorders, transmitters, and electric or pneumatic control instruments are covered in detail in the new 56 page catalog.

Vapor actuated, gas actuated, and mercury actuated thermometers and thermal systems for use between the temperature limits of —125F to 100F are listed and explained, along with separable wells and other accessories.

Flow Meter Engineering Data

415

The Bristol Co., Waterbury, Conn., has just published a new bulletin of engineering data on differential pressure type flow meters.

The 22-page illustrated bulletin gives basic information and theory on the selection, sizing and installation of the various types of primary devices.

After an introductory section outlining the theory of head type flow rate meters, the basic primary devices, their uses and characteristics are described. Approved installation practices for gases, liquids and steam are explained and illustrated. Equations for calculating throat diameters and flow rates and finding manometer ranges are given with practical illustrative examples. A series of tables of appropriate data for flow calculations concluded the booklet.

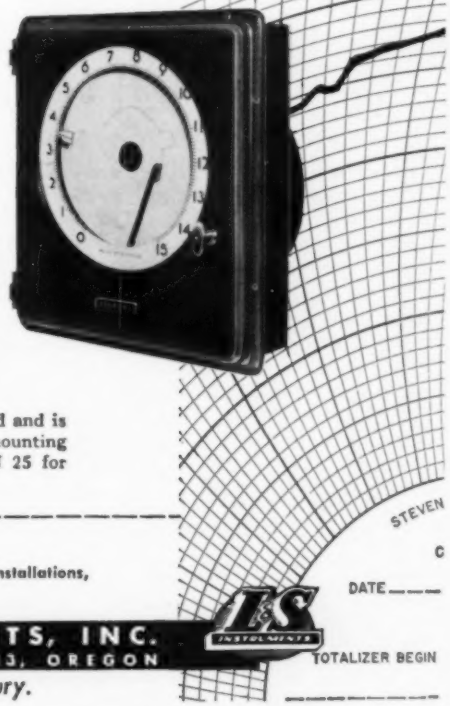
CONTINUED ON PAGE 30A

ACCURATE GRAPHIC AND VISUAL REGISTRATION

of liquid flow with

STEVENS

RECORDER TYPE B-FT



R cording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears... an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.

This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

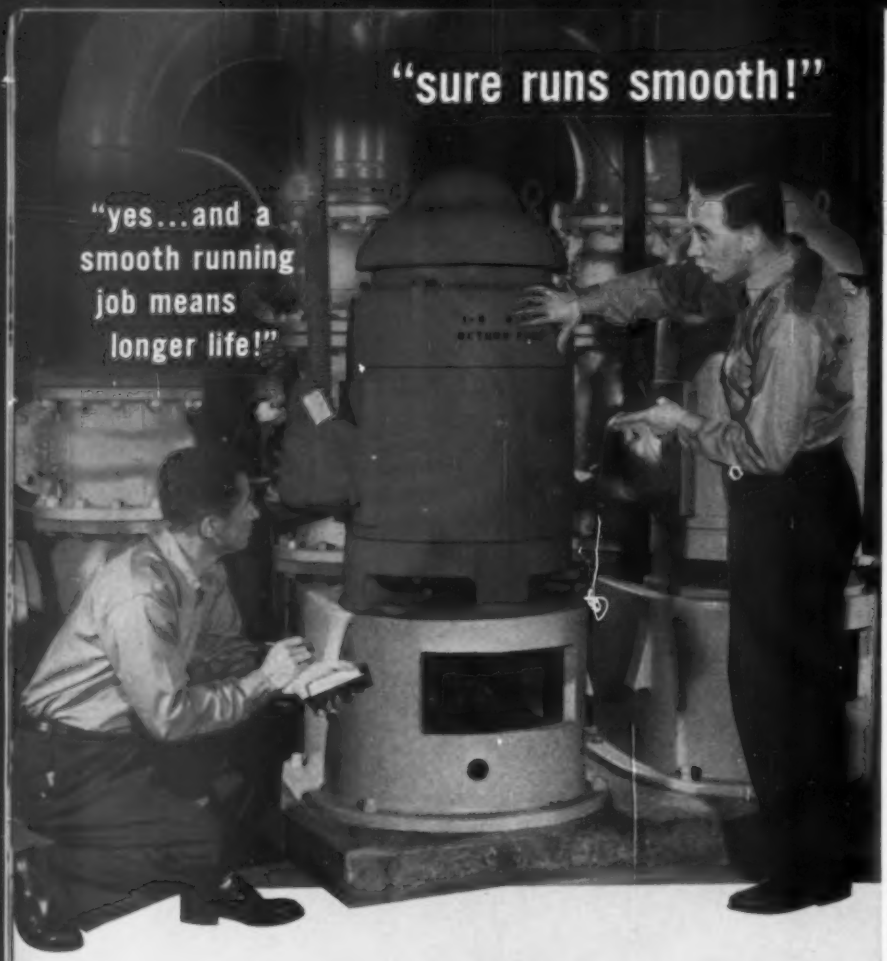
STEVENS DATA BOOK

Invaluable for your reference file. Contains technical data on recorder installations, plus a wealth of hydraulic and conversion tables. $1 copy. (No COD's)

LEUPOLD & STEVENS INSTRUMENTS, INC.

4445 N. E. GLISAN STREET · PORTLAND 13, OREGON

Specialists in hydrologic instruments for over half a century.



In U.S. Verticlosed Motors

progressive balancing eliminates troublesome vibration

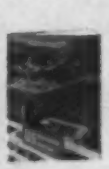
One of the first things a new owner notices about the U.S. VERTICLOSED MOTOR is how *smoothly* it runs. And there's good reason for that! Progressive step-by-step balancing the U.S. way reduces vibration to microscopic amplitude. That means *longer pump life* and trouble-free operation.

In U.S. VERTICLOSED MOTORS, not only are all rotating components balanced separately, but the *assembled motor* is balanced! Unlike ordinary pump motors, U.S. VERTICLOSED MOTORS are designed with provision for adding tiny weight increments for final balancing. The assembled motor is vibrometer-tested and corrected to less than .00084" movement before it can pass final inspection. RATINGS 1½ TO 500 H.P. In any pump installation, be sure to specify: "U.S. VERTICLOSED MOTOR."

U.S. ELECTRICAL MOTORS INC.

P. O. BOX 2058, LOS ANGELES 54, CALIF. OR MILFORD, CONN.

FREE COLOR-ILLUSTRATED BROCHURE... For full information, send for FREE illustrated Verticlosed Bulletin.



New Bulletins

CONTINUED FROM PAGE 29A

The Story of Concrete Pressure Pipe

416

Price Brothers Co., Dayton, Ohio, has published a new and revised edition of the booklet "The Story of Concrete Pressure Pipe."

This handsomely styled, clearly written booklet tells, in 24 fully illustrated pages, the history of concrete in water lines and its application to today's water and sewage systems.

Included in the fourteen sections of the booklet are simplified illustrations describing the principle of prestressing, and photographs depicting the methods used to manufacture Price prestressed concrete cylinder pipe. Other sections cover pipe installation, tapping, joints, maintenance, durability and economy.

The catalog section has been brought completely up-to-date in reference to the sizes, weights and normal operating heads of each type of pipe used for water transmission and distribution lines, subaqueous intakes and outfalls, and sewage force mains.

Buildings Savers Estimating Guide

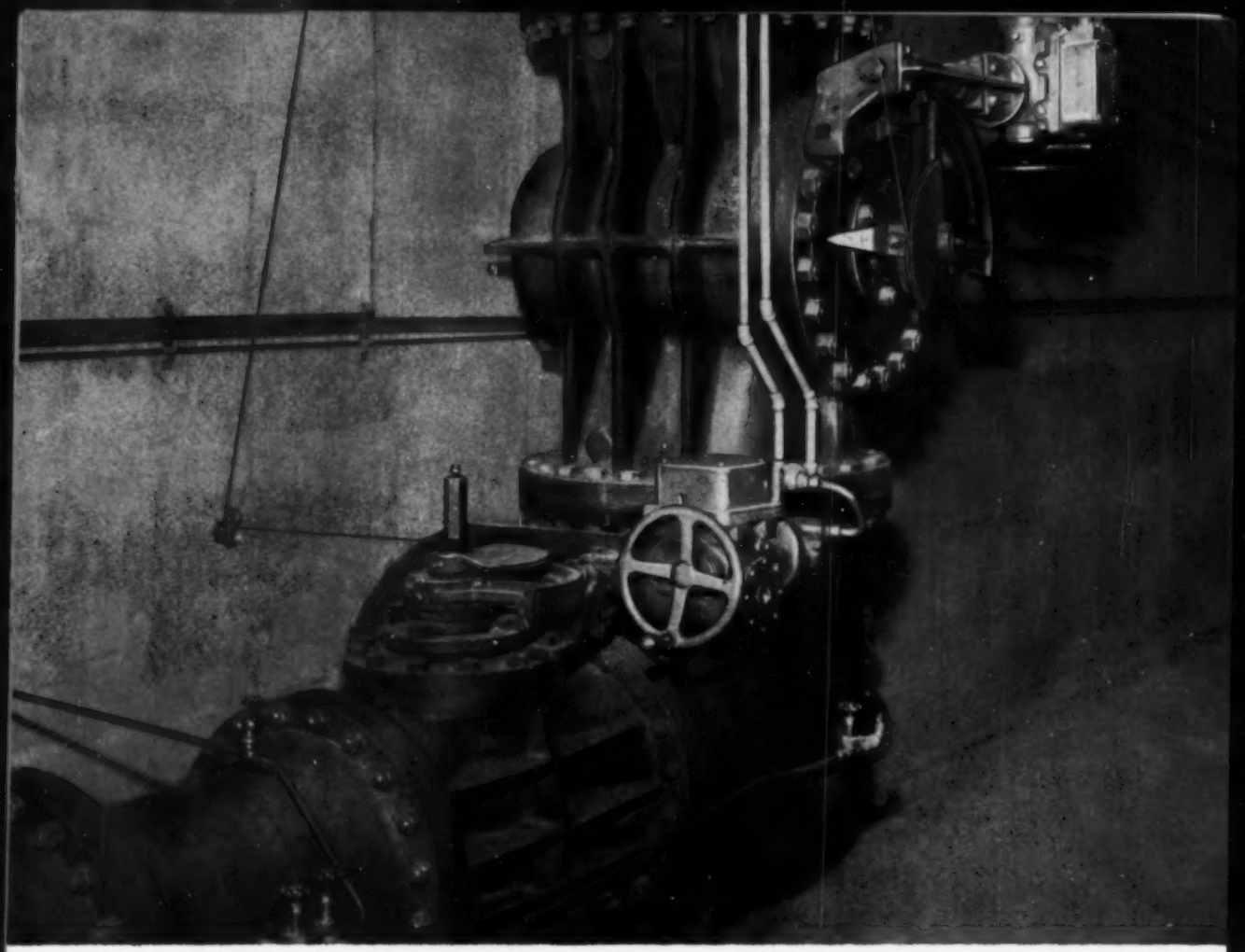
417

Building Products Division, L. Sonneborn Sons, Inc., New York, N. Y., has available a four-page estimating guide, outlining uses and costs for 37 different "building saver" products.

This two-color illustrated brochure covers a full line of products for treatments of concrete floors and wood floors, as well as admixtures for concrete and mortar, and waterproofing and dampproofing compounds. While products covered in this brochure are primarily for new construction, several of the wood treatments listed are designed for maintenance purposes.

For each product, there is quick reading information on use, quantities required, method of application and cost. From this information, specific products for any building construction or maintenance need can be selected;

CONTINUED ON PAGE 136A



HOW TO SIMPLIFY AUTOMATIC FLOW CONTROL

. . . and cut costs in the bargain

ROCKWELL-NORDSTROM LUBRICATED PLUG VALVES **are easier and less costly to automate because they're lubricated and they close with only a quarter-turn of the plug.**

Ordinary valves, especially in larger sizes, are costly and complicated to equip with power actuators because the seating members have to be raised, lowered and wedged-in for a tight seal. Rockwell-Nordstrom valves are sealed with pressurized lubricant and they close with just a smooth quarter-turn of the lubricated plug. The result: simple, easy, automatic operation that's two to five times faster yet without fear of water hammer.

You'll save money with Rockwell-Nordstrom valves year after year. Lubrication eliminates metal-to-metal wearing friction for longer valve life, less down-time and lower maintenance.

Rockwell-Nordstrom is the world's most *complete* line of lubricated plug valves, plug valve lubricants and operating accessories. They cost no more to buy, often less, than ordinary valves. Send coupon for complete details. Rockwell Manufacturing Co., Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

it's ROCKWELL

MANUFACTURING COMPANY

Rockwell Manufacturing Co.
Pittsburgh 8, Pennsylvania

☐ Please send me Bulletin C-5200.

☐ Please have your sales engineer call.

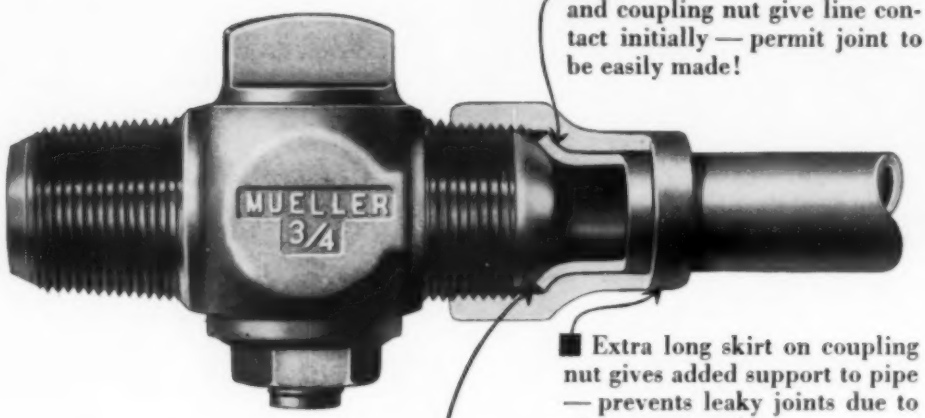
Name_____ Title_____

Address_____

City_____ Zone____ State_____

MUELLER® CORPORATION STOPS

. . . *with* MUELLER *copper service pipe connection*



■ Convex surfaces on stop body and coupling nut give line contact initially — permit joint to be easily made!

■ Extra long skirt on coupling nut gives added support to pipe — prevents leaky joints due to pipe movement!

Sizes from ½" through 2"

■ Opposed convex surfaces do not compress end of flange — give greater resistance to pipe pulling out.

See the new, automatic
Mueller CL-12 *Drilling Machine!*

At the Mueller Exhibit
AWWA Convention
Dallas, Texas

April 20th through the 25th

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

over 5,000,000,000

gallons every day

flow through Roberts-equipped plants throughout the Americas

Municipalities and industry alike, throughout the Western Hemisphere, have long recognized the complete assurance of trouble-free service year after year that is built into every Roberts water purification installation . . . the result of over 60 years of specialization and progress.

nameplate of dependability . . .

MECHANICAL EQUIPMENT
BY
ROBERTS FILTER MFG. CO.
DARBY, PENNA.

OLIVER SUPER 88

with Hydro-Trencher

"Digs rings around my ½-yd. shovel,"

SAYS NEW YORK CONTRACTOR

Ripping up concrete pavement after use of air hammer is only the start of this tough assignment. With chopping action of hoe bucket the Super 88 loosens and digs rock. Dual hydraulic controls and 180° swing provide a fast cycle.

Nick Garito of Larchmont, N. Y., doesn't mince words about the performance of his Oliver Super 88 with Hydro-Trencher.

On this job at New Rochelle he dug 100 ft. of sewer trench in heavy rock in just 16 hours. Compared with two different types of competitive equipment, he states that the Oliver is faster and requires only one man instead of two. And production, particularly in this kind of work, surpasses his bigger capacity machines.

Bites into rock or frozen ground

The tremendous down pressures of the Super 88 Hydro-Trencher make it possible to force the bucket through the hardest ground. One owner reports digging through as much as four feet of frozen ground at temperatures of 20° below zero.

Another plus value is the ability of the Super 88 to work in tight places where other machines can't maneuver. "My Oliver Super 88 has been so outstanding that three other contractors in the area have bought Oliver 88's," says Nick Garito.

Ask your Oliver distributor for the facts. Or write for literature.

OLIVER

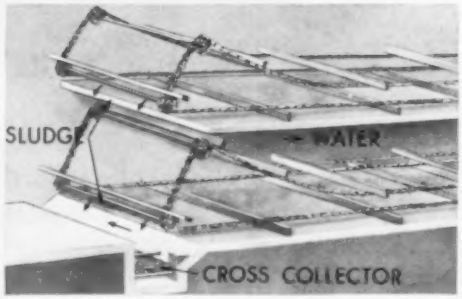
THE OLIVER CORPORATION

Industrial Sales Div., 19300 Euclid Ave., Cleveland 17, Ohio

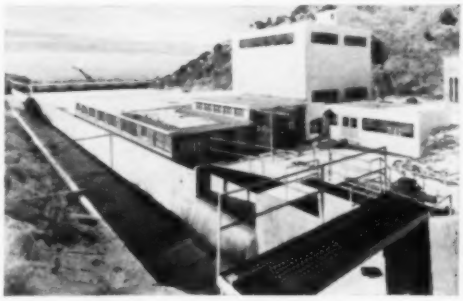
a complete line of industrial wheel and crawler tractors and matched allied equipment

● *See our exhibit at the A.W.W.A. Conference in Dallas, April 20-25*

Double-deck clarification plant! *LINK-BELT equipment at Salt Lake City cleans 32 million gpd*



TWO-STORY TREATMENT. Diagram shows one of eight double-deck settling tanks equipped with Link-Belt sludge collectors each over 300 feet long. Flocculation chambers are also Link-Belt.



INTAKE WATER is received from adjacent hydro-electric plant or by-pass canal. Leaves, sticks and other large debris are removed by a pair of Link-Belt traveling water screens.

SALT Lake City's water supply comes from mountains east of the city, carrying with it—during flash storms or fast thaws—solids amounting to as much as 60 ppm.

Called on for facilities to remove solids and purify the water, the consulting engineers were presented two unusual challenges. Topography made compactness essential—and settling tanks had to be protected from freeze-up. Both were overcome by *Double Deck enclosed* tanks, equipped with Link-Belt longitudinal sludge collectors. With this system, the Big Cottonwood plant has reduced solids to 3 ppm.

Just as Link-Belt cooperated with Consultant John A. Carollo and Co., Phoenix, Ariz., we invite the opportunity of working with you, your chemists and consultants to produce top efficiency in water, sewage or waste treatment. Call your nearest Link-Belt office.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 14,08

"Our third Cleveland –based on 15 years of dependable performance"

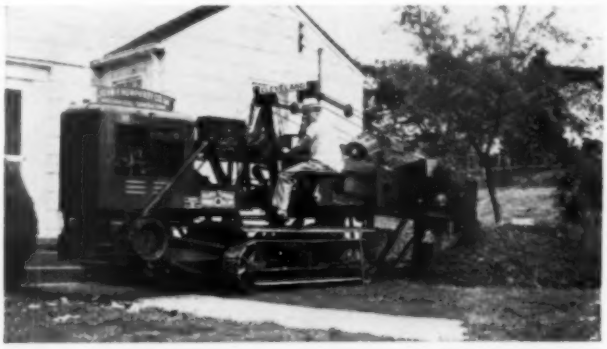
Still in good working order, the Cleveland trencher traded-in by John F. Humphrey Co. of Knoxville, Tenn. on the purchase of a new Cleveland 95 several months ago had been in steady use since 1942. "The purchase of our newest Cleveland—our third—was based on the 15 years of dependable, profitable performance delivered by our first Cleveland," says C. E. Hankins, Jr., vice president of the firm.

Shown cutting an 80-foot service line for 4-inch pipe is Humphrey's newest "95."

The firm is able to schedule more such jobs daily because the Cleveland's fast, safe truck-portability and its wide range of more than 30 usable digging speeds make it fast *to* the job and fast *on* the job.

Long-lived dependability like this is a Cleveland characteristic—one that makes your original investment pay dividends over a long, busy working life. Get complete information from *your* distributor now.

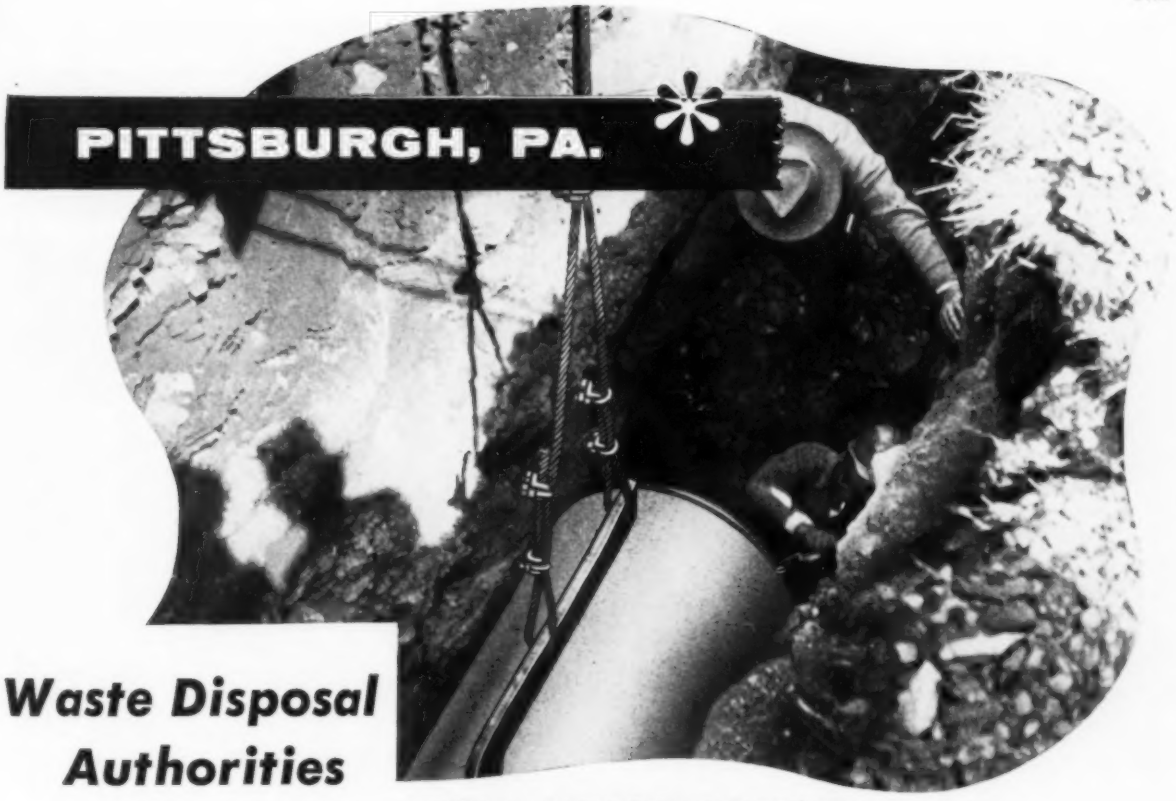
"There's nothing like a Cleveland for trenching."



Good Everywhere

The CLEVELAND TRENCHER Co.

20100 St. Clair Avenue • Cleveland 17, Ohio



Waste Disposal Authorities make sure of "NO JOINT LEAKS" with

TYLOX-JOINTED

SEWER PIPE LINES

"No joint leaks permitted . . ." said engineers and officials who planned new sewers for Upper St. Clair, Pennsylvania, near Pittsburgh. Specifying TYLOX Rubber Gaskets for coupling the pipe was one of the steps they took to help **assure** leak-proof joints.

Not only did they get water-tight joints throughout the line, but the TYLOX Gaskets "paid off" in yet another important aspect — reduced construction cost. . . . With TYLOX, workmen were able to couple pipe rapidly in spite of flooded trenches, and to eliminate "waiting time" by backfilling laid line immediately.

TYLOX Rubber Joints assure quickly assembled, leak-proof joints for **any** low head service pipe line, **anywhere!** And being made of acid-resistant, non-deteriorating rubber, they stay leak-proof for the life of the line. Write for more information if you are not already using TYLOX Pipe Joints to reduce installation cost and lengthen life of your sewerage and drainage projects.

PROJECT: New sanitary sewers for Upper St. Clair, Penna.

ENGINEERS: M. E. Frye & Associates, Consulting Engineers, Pittsburgh, Penna.

CONTRACTORS: Nicassio Construction Company, Pittsburgh, Penna.

PIPE: Reinforced concrete pipe with TYLOX Rubber Joints, furnished by Neville Concrete Products Co., Neville Island, Pittsburgh, Penna.

HAMILTON KENT MANUFACTURING COMPANY

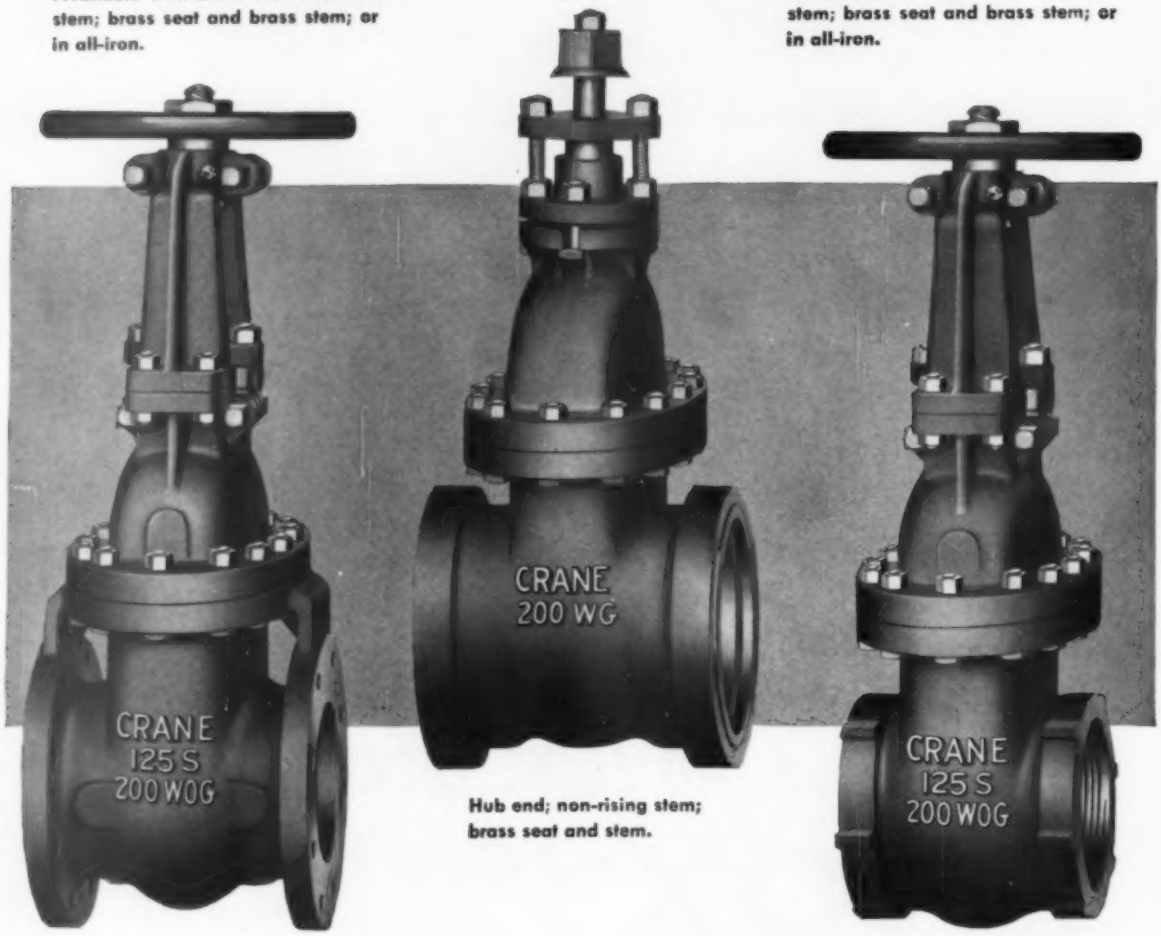
KENT, OHIO

427 West Grant St. ORchard 3-9555

5040

Flanged end; outside screw and yoke. Available with brass seat and steel stem; brass seat and brass stem; or in all-iron.

Screwed end; outside screw and yoke. Available with brass seat and steel stem; brass seat and brass stem; or in all-iron.



Hub end; non-rising stem; brass seat and stem.

Crane Iron Body Gates–Versatile Valves for Water and Sewage Services

Look to Crane for better performing 125-pound iron body wedge gate valves. Improved design gives them greater strength and important operational advantages. As a result, these valves offer dependable performance on a wide variety of services . . . easy maintenance . . . long life.

Among the advantages of Crane iron body wedge gates are:

- *Oval body and bonnet*, with extra metal where needed most.
- *No bonnet joint leakage*—More bonnet bolts on closer centers insure uniform bolt load distribution on bonnet joint and gasket.
- *Long disc guides* seat discs properly . . . minimize drag on seating surfaces . . . prolong valve life.
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- *Two-piece ball-type gland* prevents binding on stem even when gland bolt nuts are pulled up unevenly.
- *Exceptionally deep stuffing box* can easily be repacked under pressure when valves are wide open.
- *Available in 19 sizes*—2 inches to 48 inches—all-iron or brass trimmed. In addition, Crane makes companion valves in globe, angle, check, quick-opening and Underwriters' patterns.

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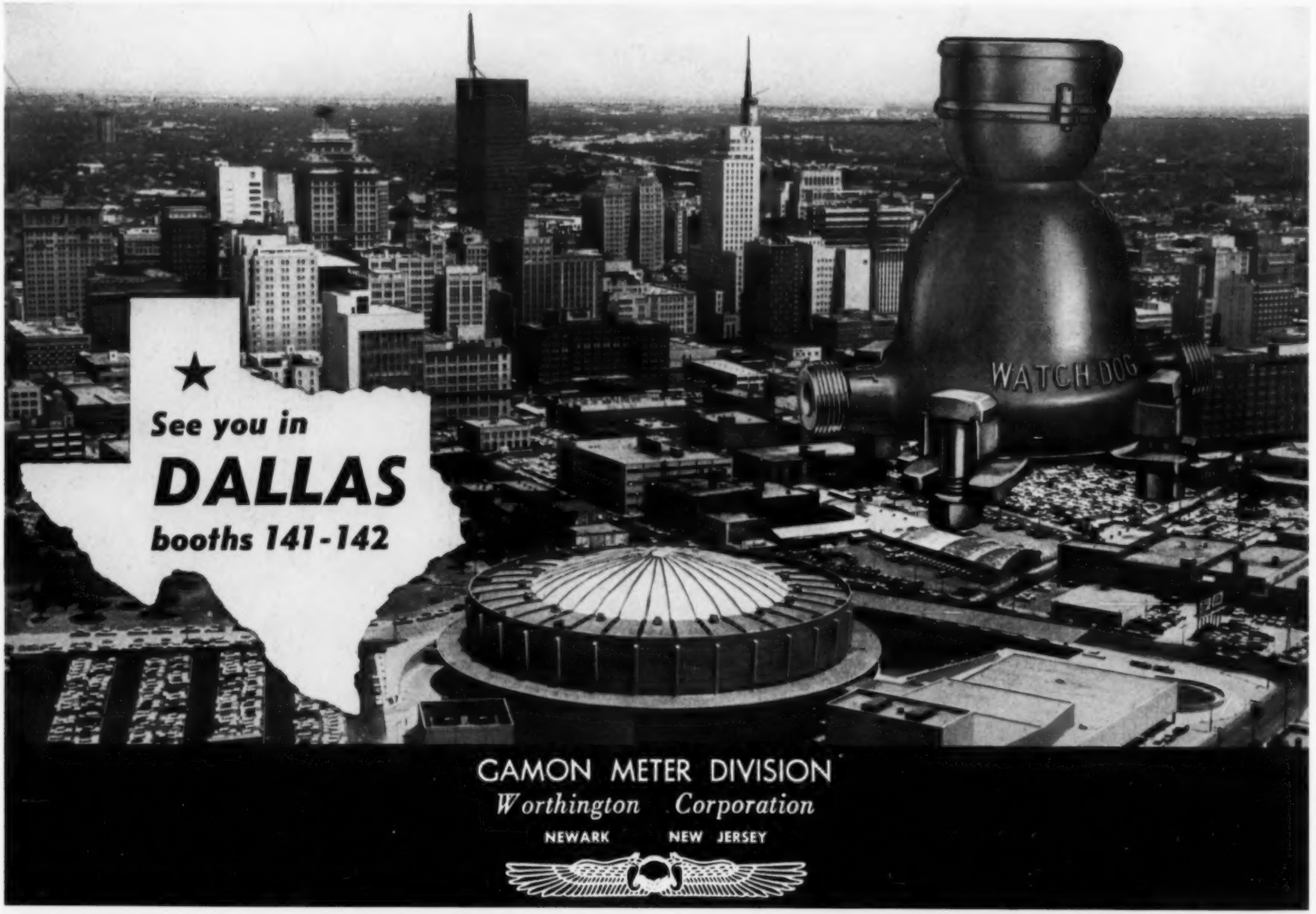
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booths 141-142
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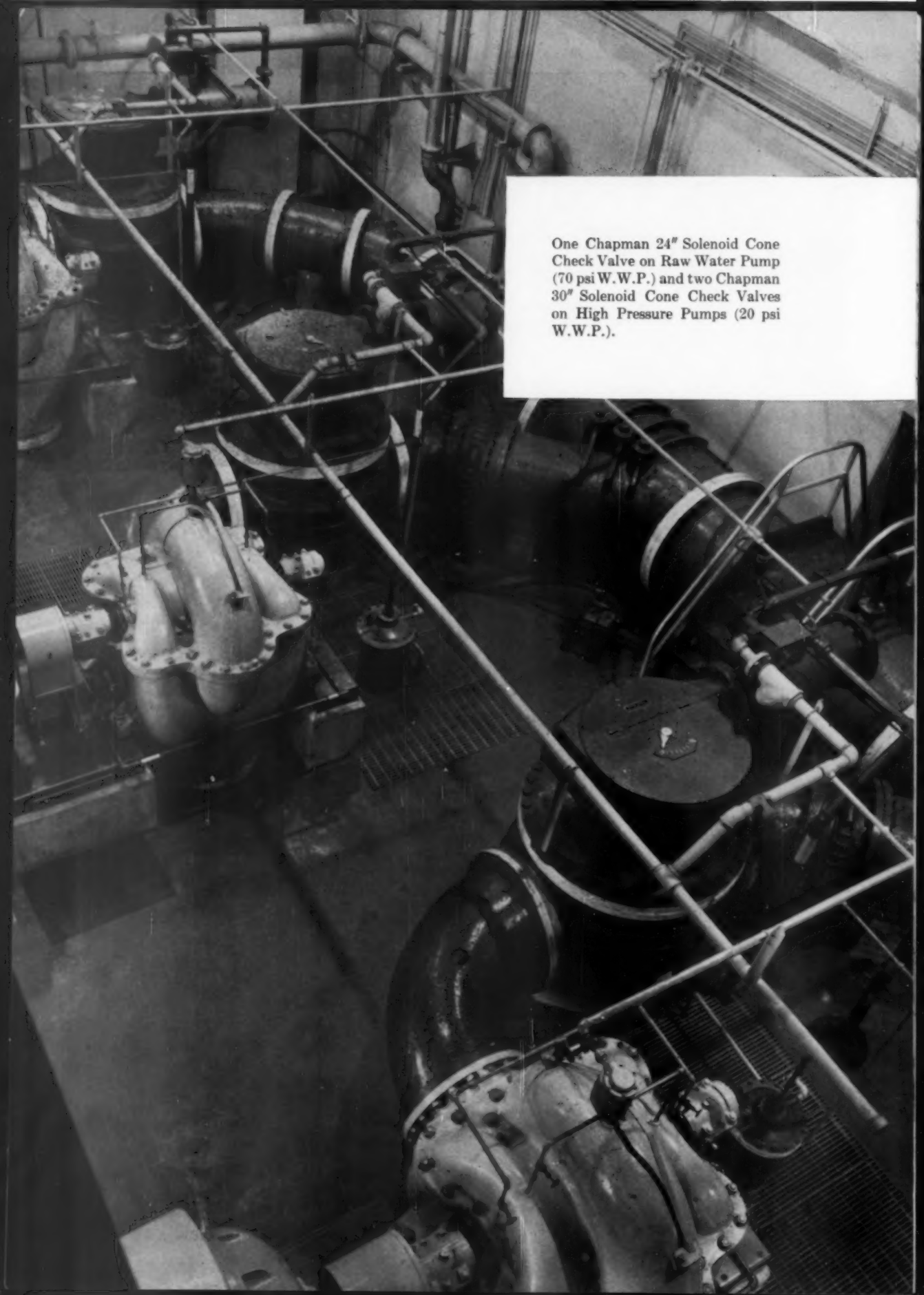
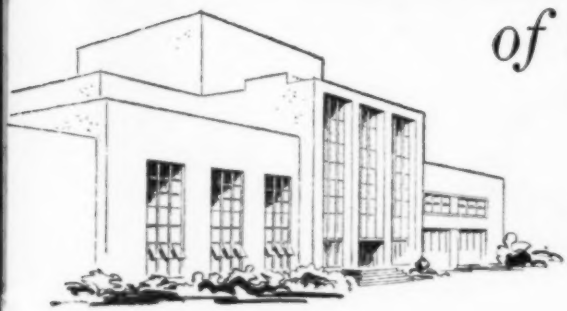


One Chapman 24″ Solenoid Cone Check Valve on Raw Water Pump (70 psi W.W.P.) and two Chapman 30″ Solenoid Cone Check Valves on High Pressure Pumps (20 psi W.W.P.).

The **CHAPMAN** *Part of the New Filtration Plant in Trenton, New Jersey*



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Trenton, New Jersey
Chief Operator of Water Dept.

The water department of Trenton has an extensive improvement program well advanced. The new filtration plant is a notable phase. Donal J. Connolly, Mayor and Director of Public Works, plans to make the water supply system of that city one of the best in the country.

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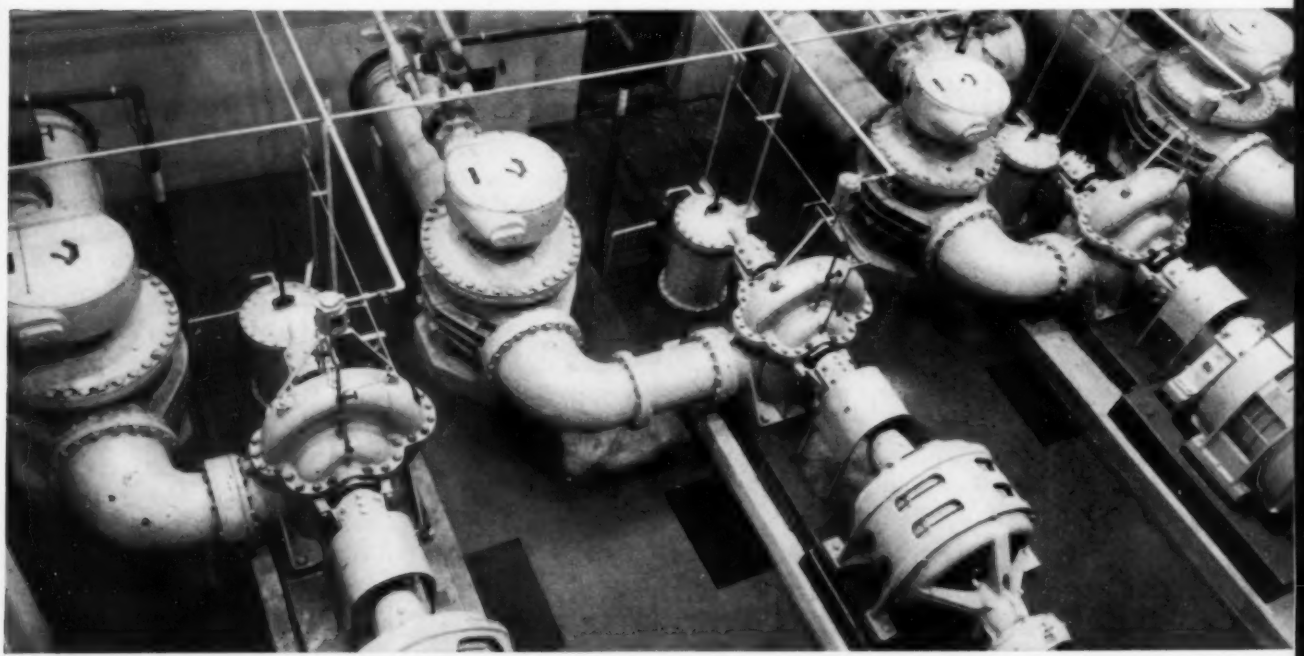

Three Chapman 24″ Solenoid Cone Check Valves on High Service Pumps (70 psi W.W.P.) and one Chapman 30″ Solenoid Cone Check Valve on Raw Water Pump (20 psi W.W.P.).

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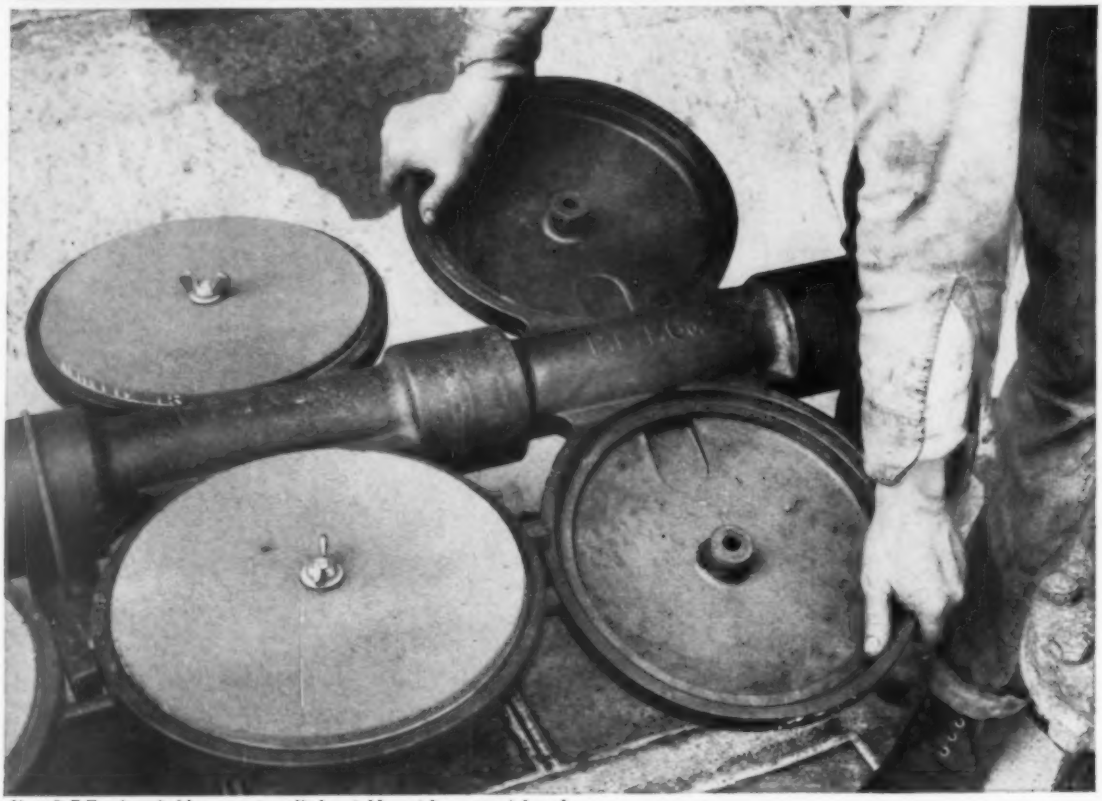

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Totally new aeration plate holders improve any activated sludge process

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CASE HISTORY: How Badger PRP* helps communities meet rising costs without raising rates

* Badger Planned Rehabilitation Program

increases water revenue 39.6%

from meters serviced in "roundup"

Increased revenue? *Really* lost revenue regained! A Midwestern community (name on request) stemmed an annual water revenue loss from old, inaccurate meters — turned it into water department *profits* with modern, accurate Badger meters.

Communities everywhere are joining in the Badger water meter rehabilitation program . . . the systematic replacement of outmoded meters or essential parts that robbed them of revenue.

Is your water department paying its way?

If not, it's time your community held its own water meter roundup — to end water waste from worn-out meters and parts, boost water department revenues, even help meet rising water department operating costs without raising rates. Send for our free booklet, "Take Five," a brief explanation of Badger's Planned Rehabilitation Program. And be sure to ask your Badger representative about our liberal water meter trade-in policy.

What makes the big difference in the meters Badger builds...

Exclusive Dovetail Thrust Roller Insert assures accurate registration

Case in point: Old style (A), with full length slot weakens chamber halves, makes them subject to distortion. New style (B) with 77% shorter slot retains original chamber strength and eliminates distortion. Dovetail design prevents shifting of insert but does not impair freedom of disc movement. Just one of many refinements in water meter construction available only with Badger's advanced meter design.

Water is vital

Badger Meters have conserved it better for over 50 years

Badger Water Meters

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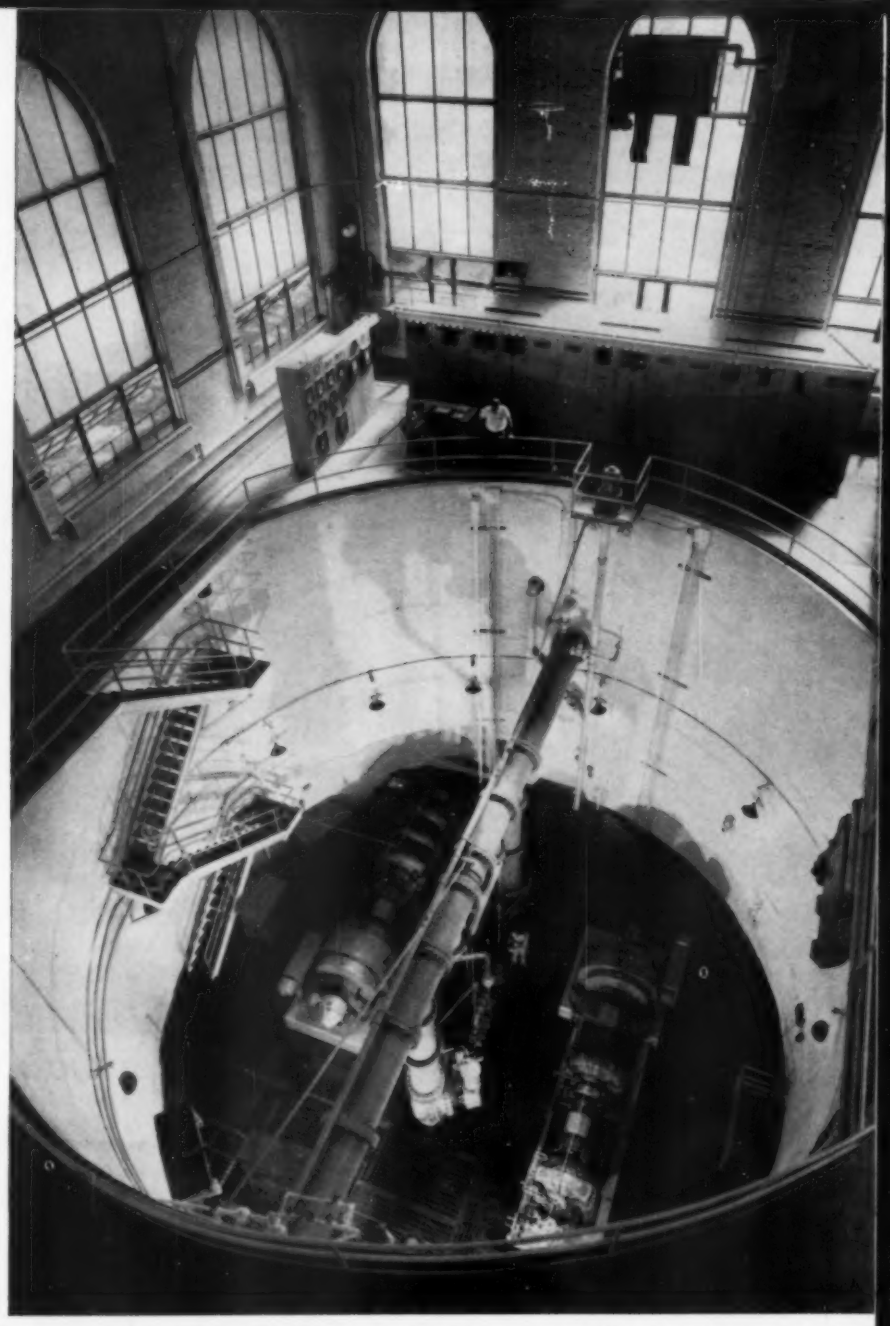
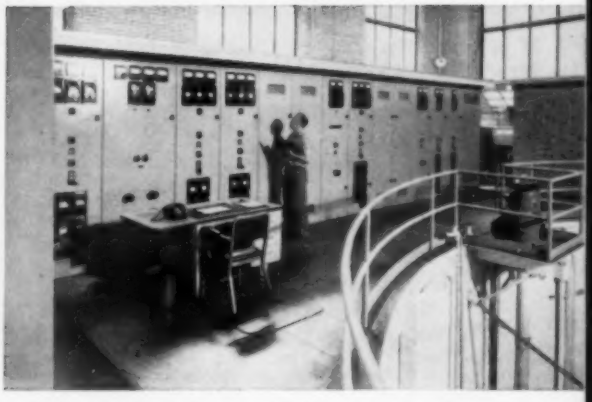
OFFICES IN PRINCIPAL CITIES



View at Nadine Pumping Station shows south pump pit containing pumps No. 2 and No. 3 with Westinghouse metal-clad switchgear and control center for all station pump motors in background.

Close-up view in booster station shows two 40-hp Westinghouse motor-driven booster pumps, Westinghouse safety switches, motor starters and power factor correction capacitor.



Metal-clad switchgear includes: incoming line section; starting breakers for 1000- and 1250-hp synchronous motors and their auxiliary field control cubicles; starting and running breakers and reactors for two 2500-hp motors.

Water pumping station saves $66,500 annually by Powering-Up electrically

The need for extensive modernization and expansion of water pumping facilities at Nadine Pumping Station of The Wilkinsburg-Penn Joint Water Authority brought about a complete change from steam to electric motor-driven pumps. One new 6.5-mgd pump was added to the three already in use to increase total capacity to 52,000,000 gallons per day.

In addition to the benefits of increased capacity and complete station electrification, comparative figures show a reduction in annual operating costs from approximately $268,000 to $201,500, for a savings of $66,500 per year. This represents an annual return of about 19% on the modernization cost of approximately $350,000. This fast five-year amortization of the investment eliminated the necessity of bond issues or other financing.

Besides the four new pump motors supplied by Westinghouse, the station now contains a line-up of 5-kv metal-clad switchgear, a 150-kva dry-type power center transformer, a motor control center for auxiliary power and a station battery and automatic battery charger.

The electrical Powering-Up of this pumping station has also made possible a more flexible discharge piping arrangement and the electric operation of valves and other equipment.

Powering-Up electrically can mean similar important benefits and savings for you. For further information, call the Westinghouse electrical construction engineer nearest you. He can help you in your Power-Up program. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

Owner: The Wilkinsburg-Penn Joint Water Authority
Consulting Engineers: Morris Knowles, Incorporated
General Contractors: Dravo Corporation
Electrical Contractor: Morganstern Electric Co., Incorporated

J-94088

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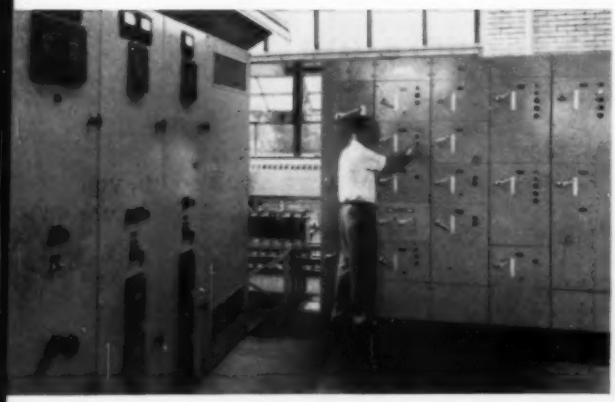
Over 250 Pages Westinghouse Data In Sweet's Construction File.



Shown at left is metal-clad switchgear feeder cubicle and 150-kva dry-type transformer. Motor control center at right contains motor starters and feeder breakers for various station auxiliaries.

Engineering group shown includes: George A. Maibach, Chief Engineer, Nadine Pumping Station; G. V. Gustafson, Morris Knowles, Inc., Consulting Engineers; M. B. Trimble, Westinghouse Construction Sales Engineer.

"Transite's installation recent increases

Says Philip J. Holton, Jr.
Chief Engineer
Water Supply Board
Providence, R.I.

"Our records show that labor and material costs have increased 100% since 1946. Yet, in this same period of time, our installation costs have increased only 21%. The ease of handling and speed with which contractors can lay Transite Pipe enable us to take full advantage of modern equipment and methods. In this way, Transite has played a prominent part in helping us offset increased costs."

Transite Pressure Pipe helps you cut system costs 3 ways: in design . . . installation . . . operation!

Today, in every part of the nation, municipal and consulting engineers choose Transite® Pressure Pipe. Ask why, and you find that economy is always among the Transite advantages they consider most important. For no pipe does so much to help keep your costs low in three different areas:

1. Design. Transite lets you plan a system for maximum efficiency. For its high carrying capacity (flow coefficient, C=140) often lets you specify pipe of smaller diameter. And because Transite's smooth interior remains smooth, you never need to make costly allowances for future reduction in carrying capacity.

2. Installation. Transite's installation speed cuts time and labor costs substantially. Light in weight for so durable a pipe, it handles easily above and below ground. And its Ring-Tite Coupling assembles quickly, surely . . . giving you a tight seal at every coupling in the system.

savings have helped us absorb in labor and material costs..."

Crews of Fanning and Doorley Construction Co. installing 8" line in Providence, R. I.

3. Operation. Here's where Transite really saves! For its maintained carrying capacity keeps pumping costs low year after year. Its strength, durability and corrosion resistance cut maintenance to a minimum, provide years of trouble-free service.

Transite's Ring-Tite Coupling cut away to show how rubber rings are compressed and locked in place to form a tight yet flexible joint.

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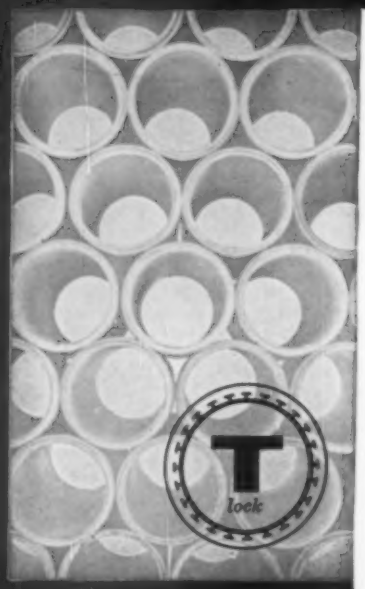
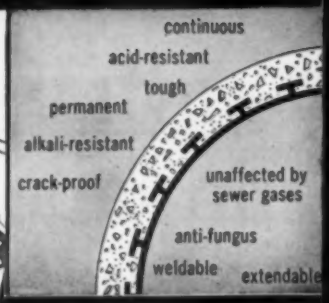
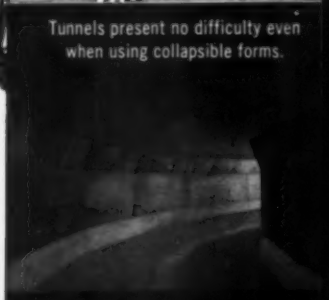
JOHNS-MANVILLE JM PRODUCTS



T-lock® sewer lining prevents hydrogen sulfide attack...





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MILLIONS OF SQUARE FEET NOW IN USE! T-Lock Amer-Plate permanently ends corrosion in concrete sewer systems—because it is impervious to hydrogen sulfide, other sewer gases, fungus, bacteria, acids, alkalies and salts.

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Readily adaptable to complex forms for cast-in-place structures.

T-Lock in place on inner form before pipe is poured.

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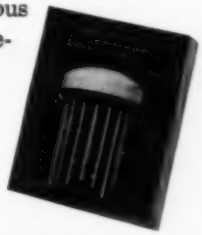
750,000 gallon tank on 120 ft tower.
Diameter 62 ft. Head range 35 ft.

by

Pittsburgh-Des Moines

These fine-appearing PDM Radial Cone Elevated Steel Tanks serving the city of Pueblo typify the value, craftsmanship and dependability inherent in Pittsburgh-Des Moines water storage units of every type. Full information on the various designs, with tables of capacities and numerous photographs, are presented in our 20-page Elevated Tank Brochure. Write for your copy.



1,500,000 gallon capacity tank on 70 ft tower. Diameter 88 ft. Head range 35 ft.

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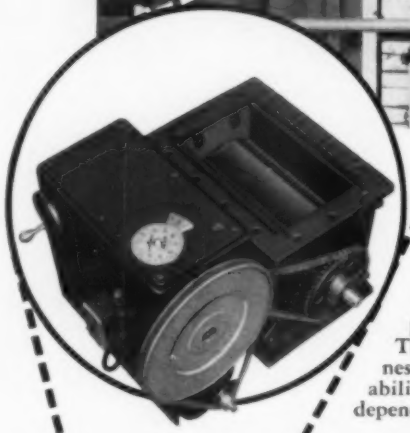

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Accuracy . . . within ±1% of set feed rate (by weight)

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Features . . . completely enclosed housing; bag-dumping hopper; Rotolock for positive, non-flood feeding.

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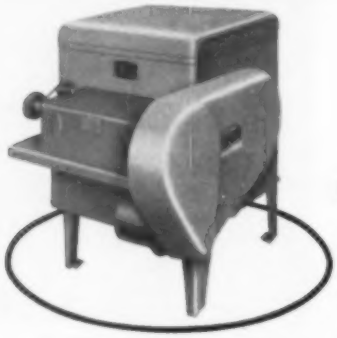
Self-contained . . . no long ducts or pipes required

Eliminate waste . . . collected dust falls back into hopper

Portable units also available

Ask about our patented bag-splitter, our wash-down dissolver, and bag loading hopper.



FOR FEEDING CARBON SLURRY . . .

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Accuracy . . . within ±1% of calibrated rate

Capacity . . . maximum rates up to 1800 gph

Feed Range . . . up to 100 to 1

Request recommendations . . . send complete details of your feeding requirements to . . . **Omega Machine Co., 350 Harris Ave., Providence 1, Rhode Island.**

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keep filter rate uniform without outside power sources

Important? Yes! Because it eliminates the danger of run-away filters when power sources fail. In addition, you get continuing accurate control to the wide-open position . . . for longer runs. You save on pumping with full-area opening . . . and no flow obstructions at the wide-open position.

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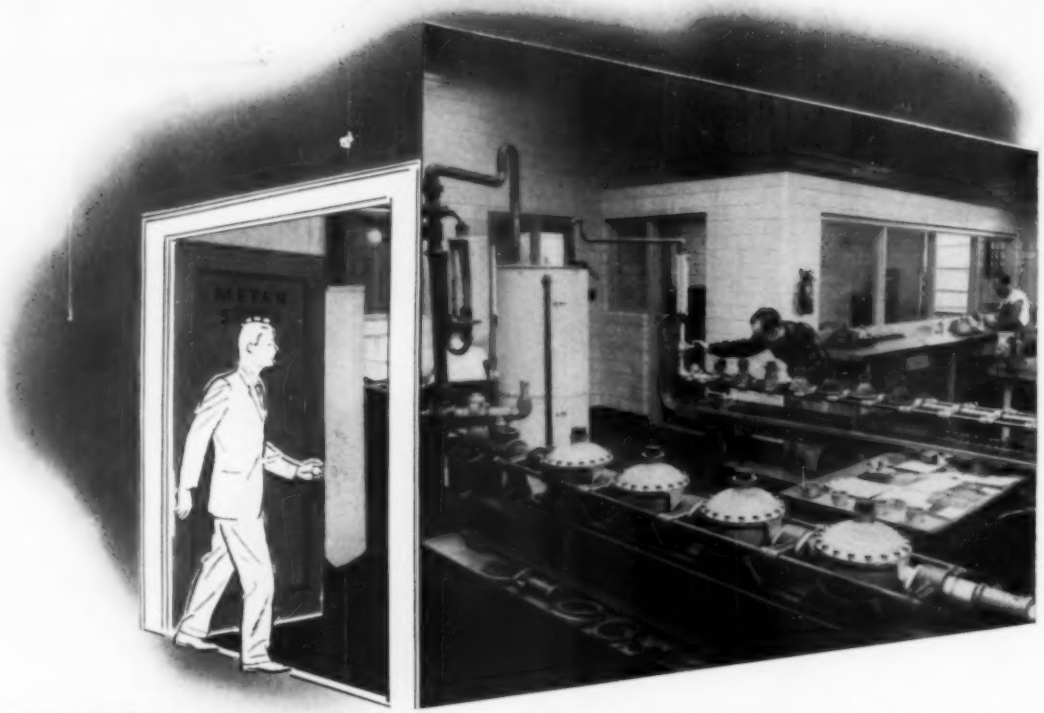

OPEN THIS DOOR before you open the bids

You learn more about true meter costs when you open the meters for repairs than when you open the bids.

A water meter is a fine instrument, and any fine instrument loses accuracy as it wears. Because of this fact, written between the lines of any water meter price are two items of cost you can't read for many years.

First, as a meter loses accuracy, it gives away revenue. Before its first overhaul it may give away twice as much money as it "seems" to save in its low-bid original price.

Secondly, to keep the meter accurate you may have higher repair costs over the years . . . or premature scrap-and-repair programs. Good meters often vary widely in this respect.

Water is your city's most vital service. You entrust it to the accuracy of your meters. Before you buy, walk into your meter shop. Talk to the men whose efforts guard your water supply. Ask which meter gives highest sustained revenue . . . with lowest repair and depreciation costs.

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Vol. 105, No. 4 · April, 1958

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WATER & SEWAGE WORKS

PUMPING STATION at Elm Fork Plant in Dallas, Tex., houses four 30 mgd raw water pumps, three 30 mgd and one 15 mgd high service pumps (at 280 ft head). This plant resulted from the theory that . . .

Planning Pays Dividends — *if followed by action*

by HENRY J. GRAESER, Superintendent,
Dallas City Water Works

EDITOR'S NOTE: Dallas, Texas, the famed "Big D" of song, story, and the world of women's fashions, is host this year to the annual AWWA Convention. This is quite fitting, for Dallas is one city which is both water- and water-works conscious. The whole country was aware of Dallas' water problems during the six-year drouth period which ended last year, but relatively few persons know what Dallas has been doing about its water supply. For this reason, we asked Mr. Graeser to prepare this article on how planning has been implemented by action in his city. This, then, is the story of the phenomenal growth of Dallas and its water supply facilities, with particular reference to developments since 1945.

■ THE GROWTH of the Dallas metropolitan area has been continuous since the beginning of the city in 1860. How steady that rate of growth has continued, with the exception of the economic depressions of 1890 and 1930, is shown in Fig. 1. Except for these periods each decade since 1880 has shown a population increase of greater than 50 per cent over the previous decade. It is no surprise then that at the end of World War II the growth of the city not only continued, but expanded. Granted freely, how-

ever, this conclusion is much easier to reach in retrospect than it was to the planners at that time.

It has been a hard matter in the past to convince the citizens of Dallas that huge investments for water supply were necessary and planning and construction must begin well ahead of the need. In 1928, when Lake Dallas was built north of the city on the Elm Fork of the Trinity, vicious attacks were aimed at officials of that day that the facility was too large and would never be used.

To compound this problem, hydrological data available at that time was not too reliable and the safe yield of this facility was considerably overestimated at 82 mil gal per day. Seventeen years later the Corps of Engineers, in studying flood control projects on the Elm Fork, re-evaluated the safe yield of Lake Dallas at 41 mil gal per day. This reduction in yield considered losses in reservoir capacity by siltage from 194,000 to 170,000 acre feet.

New Plan Needed

In any event, shortly before World War II it was evident that steps must be taken to plan additional water supply reservoirs for the city and its

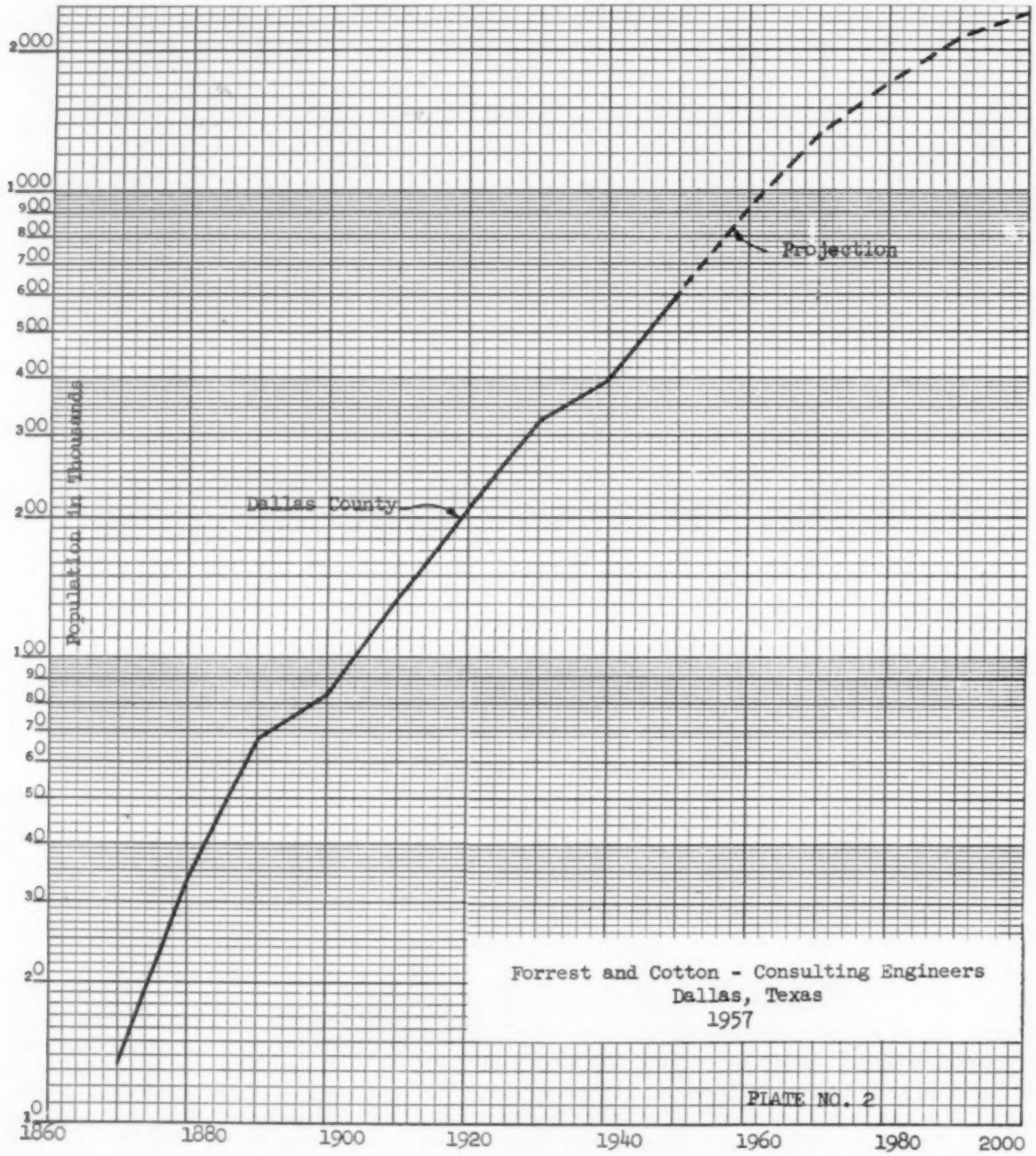


FIG. 1—Population Growth Curve for Dallas County, Texas, has been projected to year 2000 as part of analysis of water distribution system requirements of Dallas City Water Works.

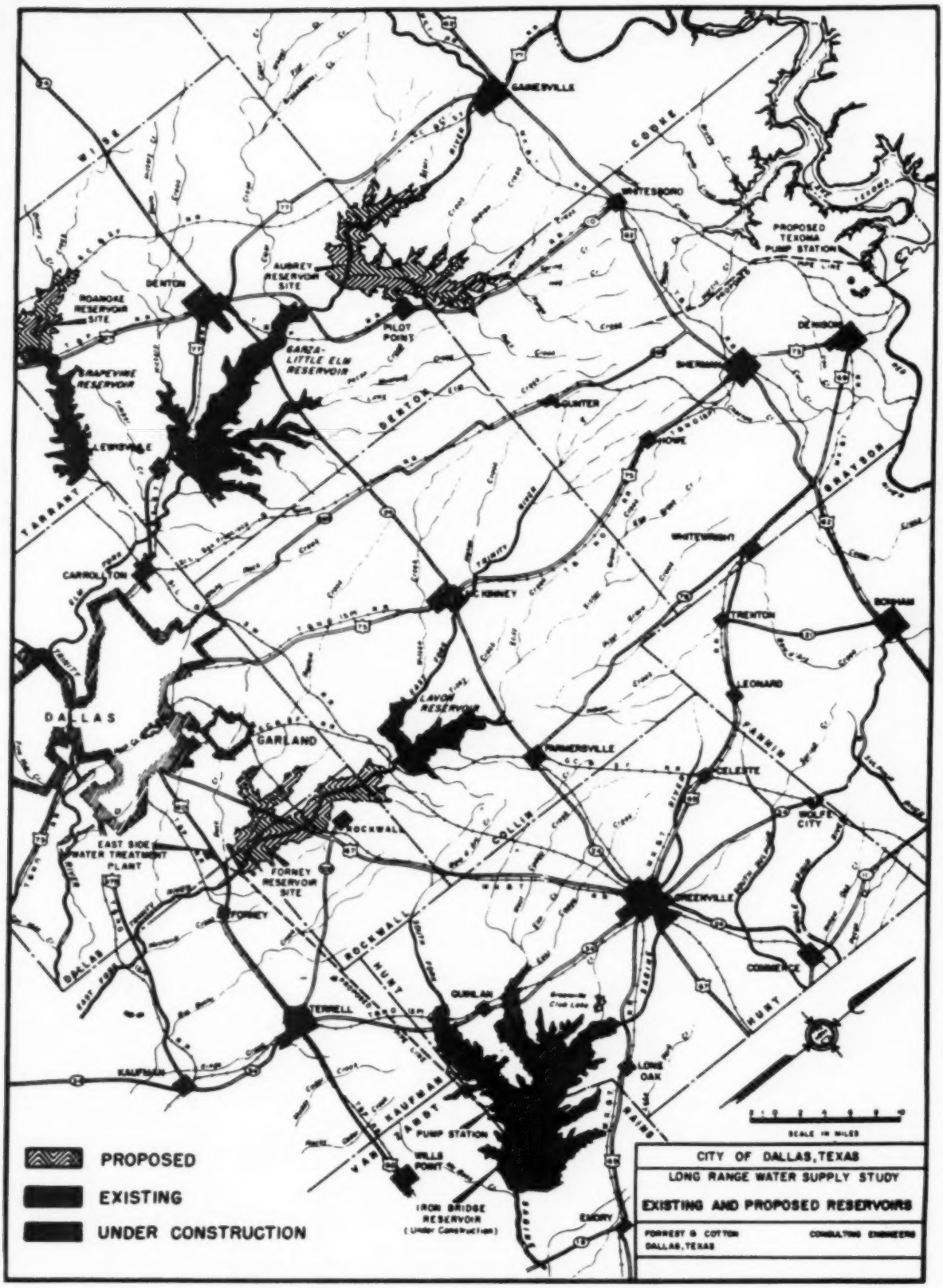


FIG. 2—Map of existing and proposed reservoirs for Dallas.

growth, and surveys were begun on feasible sites. All of these plans, however, were interrupted by the War and it was not until 1945, when materials and manpower were available, that the Federal Government re-instituted its flood control studies on the upper Elm Fork and that active planning and financing were begun on this enlargement. The Corps of Engineers in their planning saw that with a scarcity of desirable sites a dual purpose reservoir was essential.

It was with a very fine spirit of cooperation that the now completed flood control projects on Grapevine Creek and the Elm Fork of the Trinity, as shown in Fig. 2, was designed by the Corps to include for Dallas conservation storage of 415,000 acre feet in Garza-Little Elm Reservoir and 85,000 acre feet in Grapevine Reservoir. The Garza-Little Elm Reservoir encompassed Lake Dallas and a credit of 105,000 acre feet was given the City for its estimated net capacity after fifty years. Grapevine Lake was built to include 160,000 acre feet of conservation storage, 85,000 acre feet being held for Dallas.

The City of Dallas advanced the Federal Government $500,000.00 from Bond Funds in 1946 in order that planning could be initiated immediately on these structures when Federal appropriations were delayed. It was requested that first priority be given to Grapevine Reservoir on Denton Creek. On July 3, 1952 the gates were finally closed on Grapevine Reservoir after a record run-off in 1950 and a very considerable run-off in the spring of 1951. These were, however, the very last prolific rainfalls and run-off for six long years. The City was soon in the position of having adequate reservoirs completed shortly after a drouth began with a period of rainfall just about sufficient to little more than match the city's annual consumption.

Garza-Little Elm was completed in

Table 1

Water Main Extension—Fiscal Year—1956-1957

Sizes 3 to 16 Inch

	3 in. or Less	4 in.	6 in.	8 in.	10 in.	12 in.	14 in.	15 in.	16 in.
Miles in System 10/1/57	225.4098	183.7148	696.5713	573.2383	26.7380	138.8271	.0700	.2670	71.1262
Percent of Total	10.81%	8.81%	33.42%	27.50%	1.28%	6.66%			3.41%
NET TOTALS									
1938-39	1.44	1.13	9.39	2.14		.90			
1939-40	.45	2.17	13.14	4.41		5.63			
1940-41	.13	4.29	13.73	3.30		1.31			.03
1941-42	1.85	.64	7.80	2.24		.36			
1942-43	4.94	2.86	3.59	.01					
1943-44	3.17	2.35	14.97	2.88	.21	1.25			3.00
1944-45	23.42	12.10	43.36	27.16	3.61	3.12			4.79
1945-46	2.00	2.95	16.55	25.22		2.98			
1946-47	2.33	5.54	28.43	29.89		14.72			.54
1947-48	2.25	4.02	21.77	34.64		7.42			3.51
1948-49	2.96	4.66	16.68	19.93		4.52			4.34
1949-50	2.53	1.22	21.00	47.33	.0037	4.83			7.06
1950-51	.0178	4.9554	22.4184	50.3964	(.0576)	9.3556			1.6598
1951-52	45.4580	12.0881	37.7929	47.0742	(.0606)	8.7148			4.3212
1952-53	2.2438	3.2478	25.1792	39.4085	(.0487)	9.8601			4.7191
1953-54	2.0660	3.6802	25.5711	45.6600	.0051	8.5898			2.8361
1954-55	—(2.5375)	4.6823	56.0505	64.6160	.0019	12.5403			3.8653
1955-56	—(.0173)	1.8050	39.5372	42.2738		6.2302			4.0983
1956-57	—(2.8710)	1.5160	28.4922	26.8794		7.5363			2.5564

Table 1—Continued

Water Main Extension—Fiscal Year—1956-1957

Sizes 18 to 66 Inch and Totals

	18 in.	20 in.	24 in.	30 in.	36 in.	42 in.	48 in.	54 in.	66 in.	Totals
Miles in System 10/1/57	7.9179	18.8467	44.6443	28.2847	37.6734	2.7442	19.6035	3.7688	5.5491	2,084.9951
Percent of Total	.38%	.90%	2.14%	1.36%	1.81%	.13%	.94%	.18%	.27	
NET TOTALS										
1938-39										15.00
1939-40										24.90
1940-41										22.79
1941-42										12.89
1942-43										11.38
1943-44		1.81	.450	2.97	5.56					38.62
1944-45		.06	.002	.01	.02					177.66
1945-46				.66						50.36
1946-47										81.45
1947-48			1.27		.03					74.91
1948-49	.0047	1.69	7.28	5.40	1.25	1.40				69.92
1949-50		.82	5.72	2.87	.09					93.47
1950-51		3.3350	3.2830	1.6333	.0216	.0262	.0041	3.6917	5.5491	106.3298
1951-52	.4067	1.1031	1.7892	2.6411						161.3285
1952-53	3.0351		4.2811	4.5708	.7540		7.7296			105.0778
1953-54	.0496	1.9008	4.2191	.1760	1.0478	.2749	4.1770			100.5215
1954-55	.0165	.4006	4.9491	.2567	2.1108	1.0431	3.5725			151.5681
1955-56		.8683	.8953	.9775	.8698		4.0803	.0771		101.6813
1956-57		1.4989	1.6975	.0093	10.0294					77.3444

November 1954 and likewise sat practically empty until the rainy period of 1957. Then in a matter of two months conservation and flood pools in both reservoirs were brimfull and Garza-Little Elm was running as much as 3½ feet over the 600-foot spillway. The two reservoirs impounded in flood and conservation storage as much as 506 bil gal, with an uncontrolled release over the spillway of 1,250 cfs. This would certainly give credence to Texan's claims that "even weather does things in a big way in Texas."

Present Status

Our present status then finds us with two new reservoirs, now full, which have a safe combined yield of 136 mgd. Of this amount 123 mgd is allocated to the City of Dallas proper and the balance to the two island cities, University Park and Highland Park. In addition, Dallas has a contractual agreement with the North Texas Municipal Water District for a maximum of 10 mgd average of filtered water delivered at a city limits line. Our present safe yield then is somewhere in the vicinity of 133 mgd.

In 1956 the average consumption for the city, in an unusually hot and dry year averaged 93.4 mgd. For the fiscal year 1956-57, which was a record wet year, our average was 85 mgd.

In any event, it is apparent that the safe yield of Dallas' reservoirs is being rapidly approached due to the continued growth of the area and suburban areas which Dallas will serve. It is for this reason that construction of the Iron Bridge Reservoir to the east of the city has already been begun with a target date of 1960, since at our present rate we anticipate that the safe

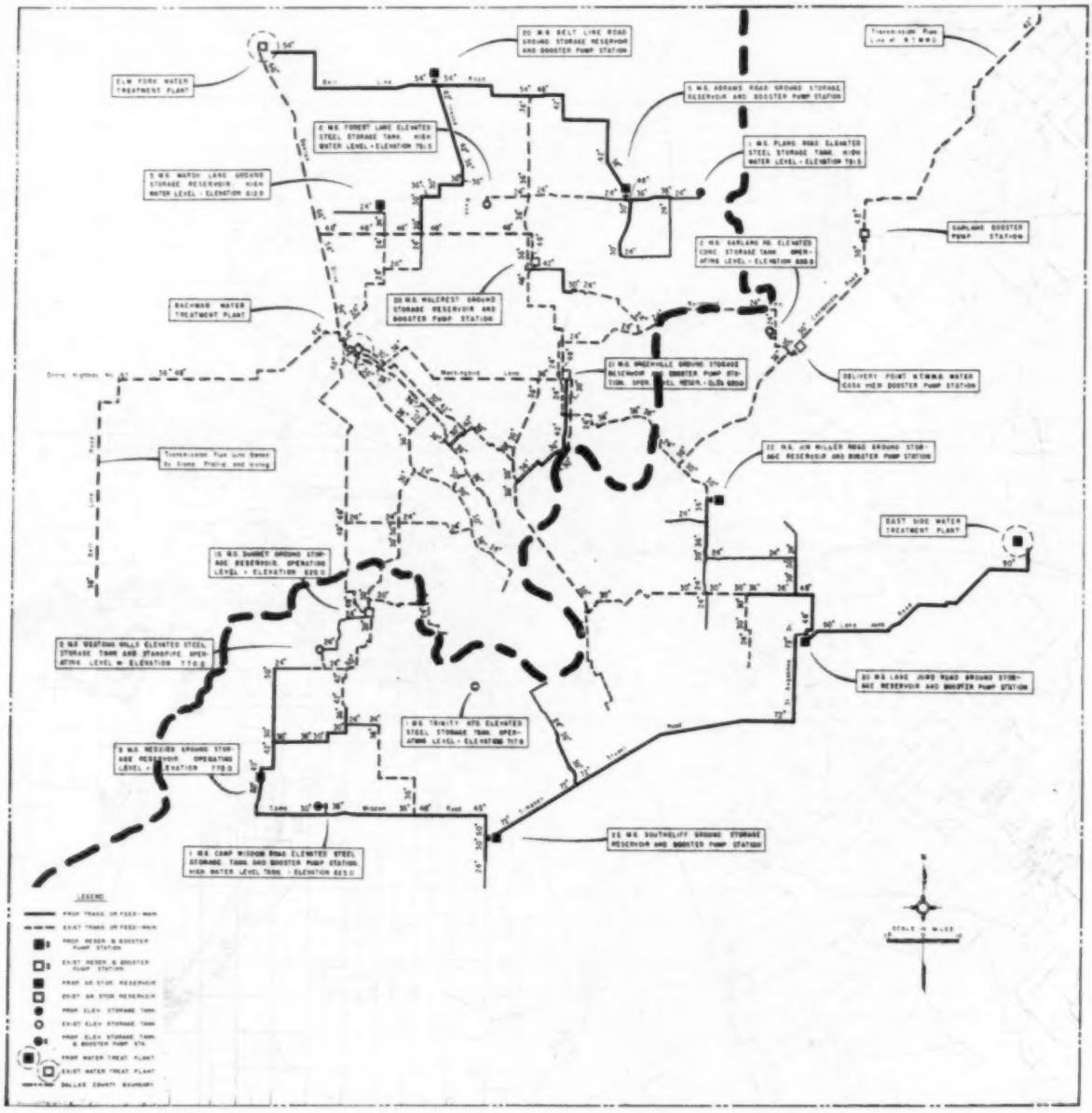


FIG. 3—Major Improvements to distribution system of Dallas City Water Works as required to meet anticipated 1980 demands.

yield of our new reservoirs will be reached by 1963.

Attendant to the increase in demand for water supply has been a continual demand for additional distribution facilities in the city. As a matter of fact, Dallas has built more linear feet of water mains since the end of the war than in the entire history of the city up to that time, amounting to some 1,291 miles of water mains, an average of about 100 miles per year.

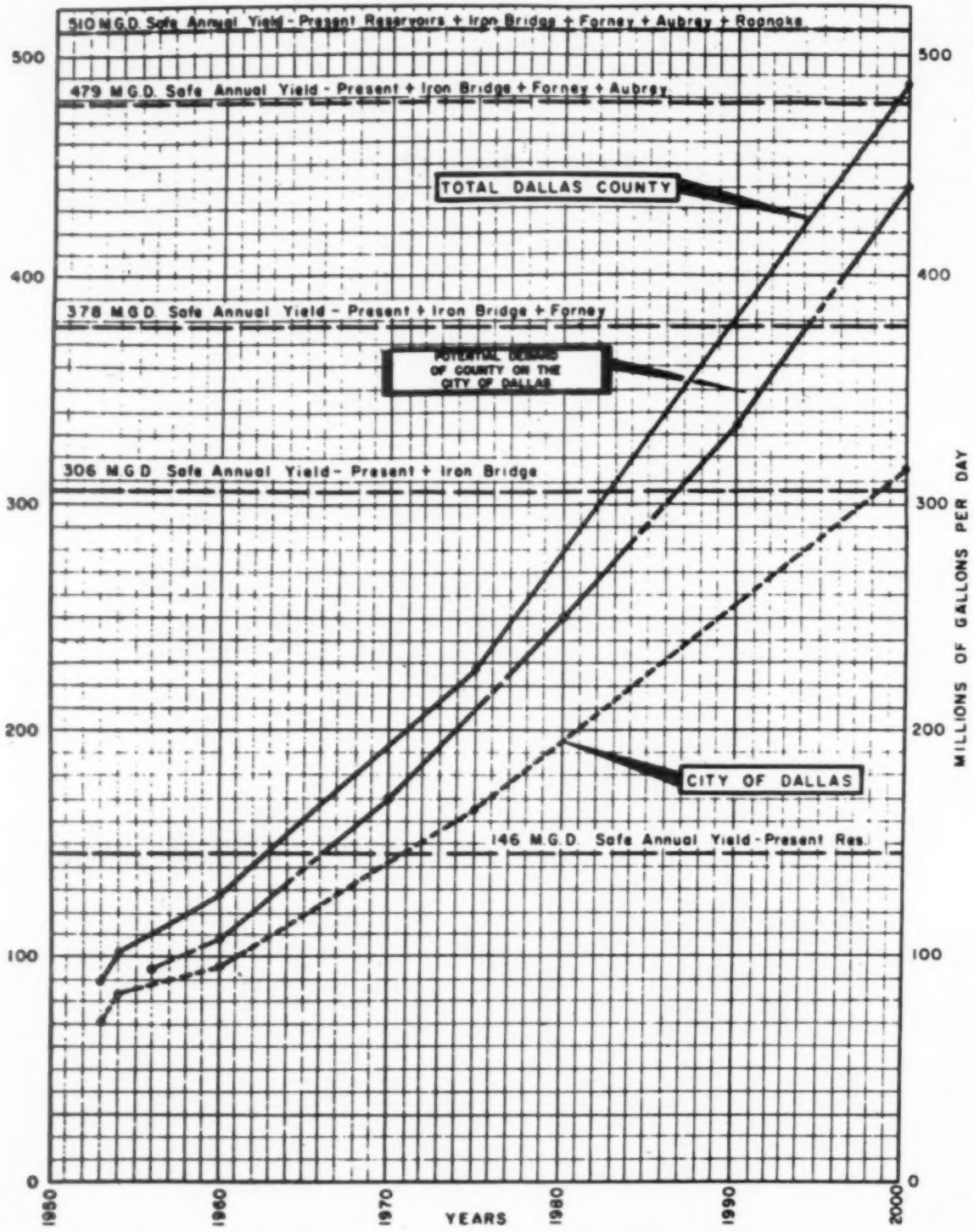

510 M.G.D. Safe Annual Yield - Present Reservoirs + Iron Bridge + Forney + Aubrey + Roanoke
479 M.G.D. Safe Annual Yield - Present + Iron Bridge + Forney + Aubrey
TOTAL DALLAS COUNTY
378 M.G.D. Safe Annual Yield - Present + Iron Bridge + Forney
POTENTIAL DEMAND OF COUNTY ON THE CITY OF DALLAS
306 M.G.D. Safe Annual Yield - Present + Iron Bridge
CITY OF DALLAS
146 M.G.D. Safe Annual Yield - Present Res.
500
400
300
200
100
0
1960
1980
1990
1970
1980
1990
2000
YEARS
MILLIONS OF GALLONS PER DAY

FIG. 4—Estimated Water Demands and safe yield of reservoirs for Dallas and Dallas County, from the Bureau of Business Research, University of Texas.

Distribution System

Table 1 shows the total mileage in the system and the percentage of each size for illustrative purposes since 1938-39.

Since the end of the war Dallas' total value of installed distribution system has totaled $46,560,000 which includes all capital expenditures on the distribution system. Likewise, purification facilities have equaled $6,111,813; water pumping facilities $1,827,588 and reservoirs $7,604,922.

Please note, however, that the funds listed for distribution system costs use the term "value." A considerable portion of this money has been derived by cash payments of developers or constructed systems contributed to the City on a total cost basis. The figures also include connection charges paid by home owners. Of the total funds spent on water projects of all types approximately $18,000,000 has been paid in cash derived from Water Works Funds as the contributions in aid of construction mentioned.

Filtration Plants

Dallas presently has two major filtration plants. Bachman, first built in 1930, has been increased twice and is now rated at 100 mgd maximum.

The Elm Fork filter plant, completed in 1951, is nominally a 50 mil gal plant, based on 2 gal per sq ft per min. With 12 filters and 2 basins it can safely produce, without difficulty, 100 mgd for a summer load. In the first unit, 12 filters were equipped in the filter building and only recently a contract was awarded to equip the additional 12 filter shells which were installed in the original plant contract so that the plant now has available 24 filters with a nominal rating of 4 mgd each.

The hydraulics of the plant are such that 200 mgd could be produced through the filters if necessary but pumping equipment, supply lines and settling basins are not available to utilize this full capacity. Engineering work is presently being performed on a new 54-in. supply line going east out of the plant to the northern portion of the city as shown on Fig. 3. With this line in place and additional pumps installed it is estimated that a maximum of 150 mgd can be produced from this facility, with the present settling capacity. The first unit of the plant cost a total of $6,050,227. Work to equip 12 filter shells is under way at a contract price of $392,450. The City furnished all of the valves at a

Table 2

Long-Range Water Supply Study for the City of Dallas

Pertinent Data for Reservoir Projects

	Under Construction		Proposed		Proposed		Proposed	
	IRON BRIDGE Dam and Reservoir		FORNEY Dam and Reservoir		AUBREY Dam and Reservoir		ROANOKE Dam and Reservoir	
Location:								
Stream	Sabine River		East Fork		Elm Fork		Denton Creek	
Stream Mile	514.5		31.8		60.0		31.4	
Drainage Area, Sq. Mi.	752		1074		682		595	
Reservoir	Elev. (Ft)	Capacity [1] (AF)	Elev. (Ft)	Capacity [1] (AF)	Elev. (Ft)	Capacity [1] (AF)	Elev. (Ft)	Capacity [1] (AF)
Top of dam	454.0	———	448.0	———	657.0	———	630.0	———
Design Water Surface	447.0	1,260,100	440.5	604,000	650.3	1,406,000	623.5	243,500
Top of Flood Control Pool	———	———	———	———	635.0	838,000	620.0	207,000
Top of Conservation Pool	437.5	897,200	434.5	466,000	626.0	600,000	———	0
Silt Deposition	392.0	[2]		[3]	579.0	[4]	585.5	[6]
Dam:								
Type	C & E F [8]		C & E F [8]		C & E F [8]		C & E F [8]	
Total Length, Feet	29,900		13,100		14,450		13,850	
Maximum Height, Feet	85		66		127		96	
Spillway:								
Type—All concrete gravity weir	Uncontrolled		Gated		Uncontrolled		Gated	
Total Length, Feet	490		912		820		490	
Net Length, Feet	450		760		400		400	
Crest Elevation, Feet	437.5		414.5		635.0		590.0	
Gates, Number and Size	———		19 — 40 x 22 ft tainter		———		10 — 40 x 30 ft tainter	
Reservoir Yield, mgd	160		72.5		101 [5]		31 [7]	
Project Cost:								
Dam and Reservoir	$19,536,562		$27,480,000		$19,551,000		$10,992,000	
Transmission Facilities	25,944,418		0		0		0	
TOTAL	$45,480,980		$27,480,000		$19,551,000		$10,992,000	
Annual Cost:								
Interest, 3.5%	$ 1,592,000		$ 961,800		$ 684,290		$ 384,720	
Amortization	882,980		533,200		379,290		213,240	
Operation & Maintenance	512,400		68,000		60,000		60,000	
TOTAL	$ 2,987,380		$ 1,563,000		$ 1,123,580		$ 657,960	
Cost of Water per 1000 gal	$0.051		$0.059		$0.031		$0.058	
Conservation Storage, mil gal	292,353		151,847		195,511		———	

[1] Capacity after siltation.
[2] 28,800 AF reserved for silt storage.
[3] 24,000 AF reserved for silt storage.
[4] 50,000 AF reserved for silt storage.
[5] Yield based on providing 238,000 AF flood storage in Aubrey Reservoir in exchange for 218,000 AF conservation storage in Garza-Little Elm Reservoir.
[6] 31,000 AF reserved for silt storage.
[7] Yield based on providing 207,000 AF flood storage in Roanoke Reservoir in exchange for equivalent conservation storage in Grapevine Reservoir.
[8] Concrete and earth fill.

Note: 1 Acre-Foot = 325,850 Gallons.

TWELVE FILTERS, each of 4 mgd capacity, comprise existing south filter gallery at Elm Fork Plant. Operating tables control hydraulic valves on each filter.

total cost of $67,708 for installation by the contractor.

Even so, despite these improvements, the demands for summer sprinkling continue to grow and our problem is two-fold—not only must we stay ahead of the safe yield of the reservoir system, but production facilities demand an even closer target date than the development of the additional water supplies. The drouth served a good purpose by awakening the citizens of the area as well as the citizens of our entire state to the necessity for water planning coupled with a program of construction aimed at assuring an adequate water supply available for the areas' anticipated growth.

More Expansion Needed

Our continued expansion, coupled with the drouth, brought the people to thinking and planning for a big city rather than one which was going to stop growing. While the water shortage problem was acutely before the public a citizens committee was formed, headed by Mr. Vollmer, President of the Texas & Pacific Railroad, to direct and advise on a program of water development for the city to the year 2000. The firm of Cotton & Forrest, Consulting Engineers, Dallas, was retained by the City and directed to report to the Water Advisory Committee their studies and recommendations for development of this supply.

The initial step taken was to obtain a reliable forecast of the potentialities of the Dallas area. For this work the University of Texas Bureau of Business Research was retained to study not only comparative growths of other cities, but to investigate the potentialities of industry and commerce in the Dallas area. From these studies the Bureau was to develop the number of workers and attendant population which would result from projected economic potential of the area. Figure 4 shows the result of their study in terms of water supply requirements for the city. These studies are broken down into Dallas County as a whole, which is metropolitan Dallas, and the City of Dallas proper. An intermediate line has been drawn to designate the cities in Dallas County which will most probably request suburban service from the Dallas supply.

It is well to note that the City Council has accepted the recommendations of the Citizens Committee and consultants that the Dallas system act as a metropolitan water system to the Dallas County area. This decision was wisely reached on the basis that sites for reservoirs are limited in the relatively flat land country of Texas. It is beneficial to the area as a whole that one city be the "Watermaster" for the area. In this manner the largest city with sufficient capital resources would develop selected sites to their maximum potential rather than for a large number of small dams to preempt the sites.

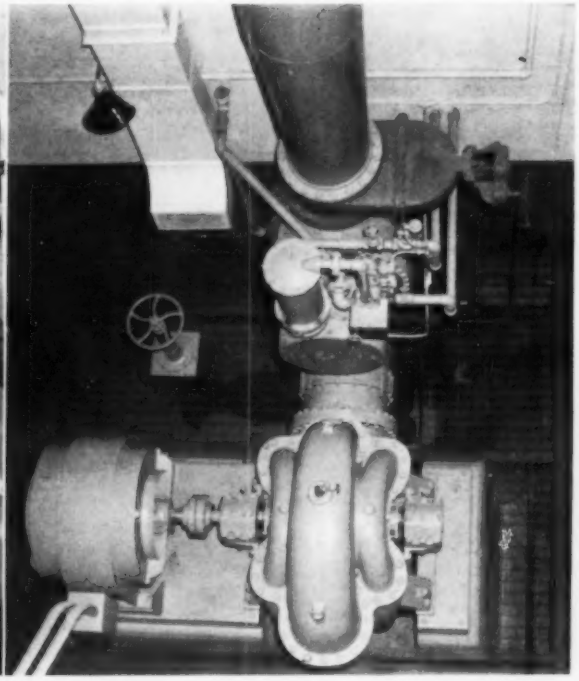
The State Board of Water Engineers granted to the City of Dallas the water rights as requested upon this pledge to serve our suburban cities. Proceeding from this point then, our master plan of development for the year 2000 has been developed as shown on Fig. 2.

Present Plans

Our plans call for immediate construction of the Iron Bridge Reservoir on the Sabine River with estimated yield of 200 mgd. This reservoir is presently under construction. To meet summer peaks, however, development of a second reservoir closer to the city on the East Fork will be begun in the near future. This reservoir will have an additional yield of 72.5 mgd.

Somewhere around 1982 the construction of additional reservoirs on the Elm Fork and Denton Creek sites above our existing lakes will be necessary to increase the yields of those reservoirs sufficient to meet our estimated requirements to the year 2000. Table 2 gives detailed design data for all of the proposed reservoirs in the Long Range Plan.

SETTING BUTTERFLY VALVES in filter gallery at Elm Fork Plant.



LOW SERVICE raw water pumps are located at river level, 58 ft below discharge level.

The Sabine Reservoir will not be owned or built by the City. In the state of Texas many of our major river basins are under the jurisdiction of River Authorities established by the State Legislature. These authorities are responsible for planning water basin development and authorized to sell revenue bonds and construct reservoirs for that development subject to the Board of Water Engineers granting a permit for impounding.

In establishing the Sabine River Authority, the Legislature required that they begin construction on a dam east of Dallas, called the Iron Bridge site, not later than January 1958. Thus, it was to the mutual advantage of the River Authority and the City of Dallas when the City selected this site as a first step in its program of construction for future water supply.

By contract then with the River Authority, ratified by a vote of the people of Dallas and an Act of the Legislature, the City agreed to pay the Sabine River Authority the entire cost of the dam and land necessary to develop the reservoir, provided the City would have entire rights to 80 per cent of the water yield from the reservoir. Construction was begun on this facility early in 1956. It is now estimated to cost approximately $15,500,000 upon completion in 1960, much less than preliminary estimates.

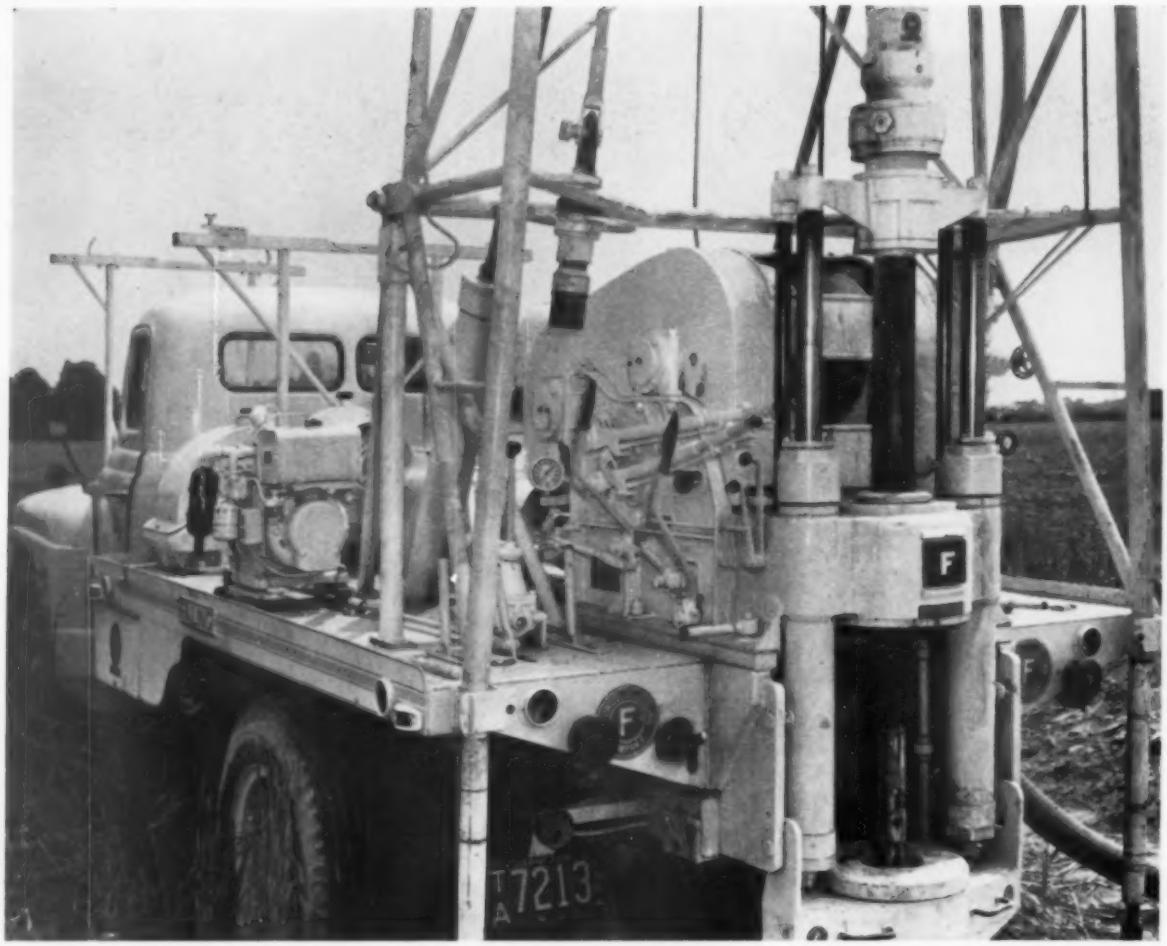
Forrest & Cotton, Consulting Engineers, designed the dam and are supervising its construction. This firm has also been given the contract by the City of Dallas for design of the raw water pump station and intake at the lake, a 34-mile raw water supply line 72-in. in diameter for the first stage of construction, and a new filtration plant to be located near the east county line.

Concurrent with this work the firm was given a task of surveying the water distribution system of the City of Dallas in the light of our new suburban policy and recommending a master plan for distribution of these new supplies. Thus, the eastern supply was allocated to the southern portion of the county as designated by the dashed line on Fig. 3, while the existing reservoirs on the Elm Fork and Denton Creek were allocated to the north and western portions of the county. Elements of the distribution system shown on Fig. 3 are designed for the estimated 1980 requirements. However, careful study was made to determine that this plan would apply and work against the year 2000 requirements.

We are now in the process of building elements of supply which will fit this master plan. Our present plans call for completion of the new east side filtration plant, 34 miles of raw water supply line from the reservoirs, and nearly 102,000 feet of filtered water distribution line from 96 to 72 in. in size to a 25 mil gal terminal reservoir in the southern part of the city. These first elements we propose to finish by 1963. The major distribution system elements in Dallas County are shown by solid line on Fig. 4.

The Sabine project, including the transmission lines, filtration plant and terminal reservoirs, involves funds estimated at $43,000,000. The first stage of the Forney Reservoir on the East Fork will be necessary about 1965 to provide peaking supply to the new East Side plant.

We believe this time we have planned big enough, and planned in a manner which will allow orderly development. Dallas is ahead in its water supply now and intends to stay ahead.



ROTARY RIG used for light to medium drilling is the trade mark of the . . .

Modern Well Driller

by OLIVER C. LEWIS, Vice President
Layne-New York Company, Inc., Camden, N. J.

■ NO WELL DRILLING ORGANIZATION started more inauspiciously than did the now famous Layne organization. Its founder, M. E. Layne, went into this centuries-old business in South Dakota in 1882, seven years before that territory achieved statehood. His rig was powered by his own muscle and he went from homestead to homestead drilling wells between 1½ and 3 inches in diameter with depths up to 460 feet.

From this start the organization has grown to be worldwide. And although development of ground water is still its chief interest, the methods used in finding water and developing it are vastly more complicated, more accurate, more successful and longer lasting than they were even 20 years ago. Therefore, the concern is engaged in other avenues of endeavor.

Complicated modern living in the home, involving automatic dish washers and washing machines has increased the importance of water quality. This is also true in industry, where specific industrial processes, such as the manufacture of titanium dioxide (used in white paint) and high-grade papers (such as cigarette paper), call for tailor-made water.

This turn of events in many instances has put the modern well driller in the water treatment business. Some have allied themselves with water treatment people; others

Ed. Note: This paper was presented before the Pennsylvania Water Works Operators Association and it published here by permission.

have developed their own interests in this field. The Layne organization, for instance, is now manufacturing and installing its own treatment equipment, just as it has with deep well turbine pumps for many years. It also has a complete treatment field department for field analysis, pilot plant operation, and plant installation.

It is not at all unusual for larger ground water supply contractors, as they are now known, to enter into a guaranteed quality and quantity type of contract. Quite frequently the water supply contractor will enter into a general contract to make a test survey, develop a test well to test for quality and/or quantity, put a pilot treatment plant at the test well site and by various test runs come up with the best way to treat that particular water for the particular purpose for which it will be used. This usually involves iron and/or manganese removal, dispersal of gases, corrosion control, and sometimes softening or demineralization.

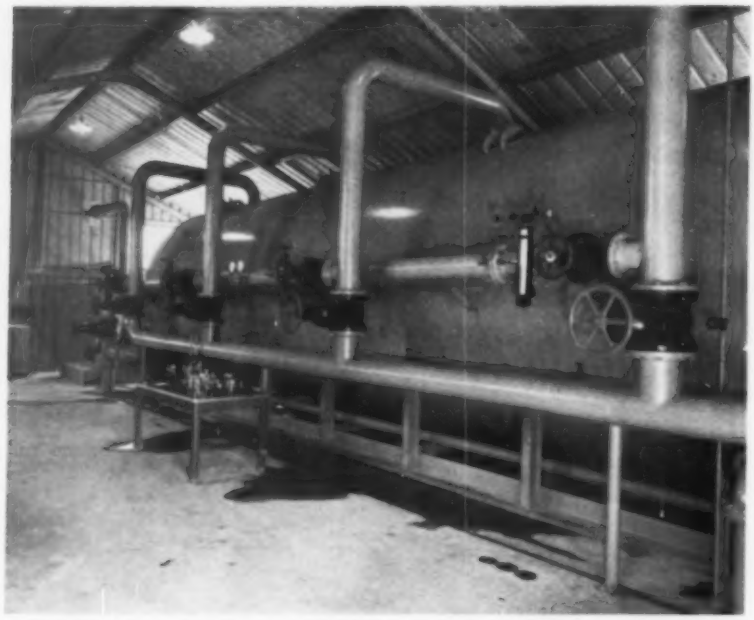
He will then work very closely with consulting engineers, chosen by the user, to design a complete well water system and treatment plant, including underground piping, electrical wiring and controls, chlorination and other chemical feed, metering and other instrumentation, pump house and filter house design, deep well pumping equipment, and high pressure service pump. After design he is anxious to continue his responsibility for the success of the entire project by making the entire installation under a general contract.

Not only does the up-to-date driller find himself engaged in such complicated matters as just described, but he also has many other jobs he is called upon to perform. In fact, he is even likely to be called upon to perform duties of a civic nature. He may be called upon to serve on committees citywide, statewide, or areawide in scope, having to do with the important subject of water resources.

Some of his other jobs involve development and design of water systems for fire protection in accordance with the standards of the National Fire Protection Association, perhaps serving on their fire pump committee; contracting with the Corps of Army Engineers for the installation of relief wells in back of dikes; contracting with heavy contractors for dewatering wells for various purposes; contracting with sewage authorities for drilling vertical connections to sewage systems running through rock; contracting for the special drilling task of developing wells for the return of water to the ground, as well as mine shafts for various purposes.

It can thus be seen that a modern well driller has a vast knowedge and experience and must be superbly equipped to be successful in all of

CABLE TOOL RIG drilling vertical connection between existing sewer line and new tunnel interceptor for Allegheny County Sanitary Authority at Pittsburgh, Pa. New interceptor line is approximately 100 feet below old sewer line. Cable tool rigs were used on all vertical shafts up to 36 inches in diameter; reverse rotary process was used on 15 shafts of more than 36-inch.



REMOVAL of oxidized iron, following aeration, clarification and addition of lime is accomplished in 4-celled Multicell filter (by General Filter Co.).

his various kinds of ventures. However, let us now go back to the subject of the development of ground water supply, with special reference to Pennsylvania.

It has been said that perhaps 50 per cent of the United States is supplied with ground water, the balance being supplied with surface water. Probably in Pennsylvania this does not hold true. The basic geologic structure of the entire state is rock occurring close to the surface and a large percentage of the state is underlain with such closely knit rocks as Baltimore gneiss, gabbro, or granite, which produce little or no water. In other areas, underlain by shale, medium quantities are available. There are a few locations where cavernous limestone produces large quantities. State College is one of these areas.

Probably one of the big potentials for the development of ground water in the state is from the glacial sands and gravels lying in the flood plains of the larger streams and rivers in the northern and western parts of the state. Even though these deposits may exist only to shallow depths (that is, 50 to 70 feet below the surface), it often is possible to develop large quantities by installation of a double-cased gravel-wall well. For example, at Athens, Pa., in the flood plain of both the Susquehanna and the Chemung Rivers, a well was drilled only 53 feet deep. The static level in the well is 29 feet; the pumping level is only 31 feet when pumping at the rate of 1,500 gpm. Therefore, this well produces 750 gal per foot of drawdown.

Despite this potential in these parts of the state, as well as from the marine deposits of sand and gravel along the Delaware River from Morrisville to the airport section of South Philadelphia, probably the larger percentage of industry and population will be supplied from surface reservoirs or streams.

Of course, wherever possible ground water will be developed. Industry has learned to investigate the possibility of large supplies of ground water before choosing plant sites. Ground water has the following advantages:

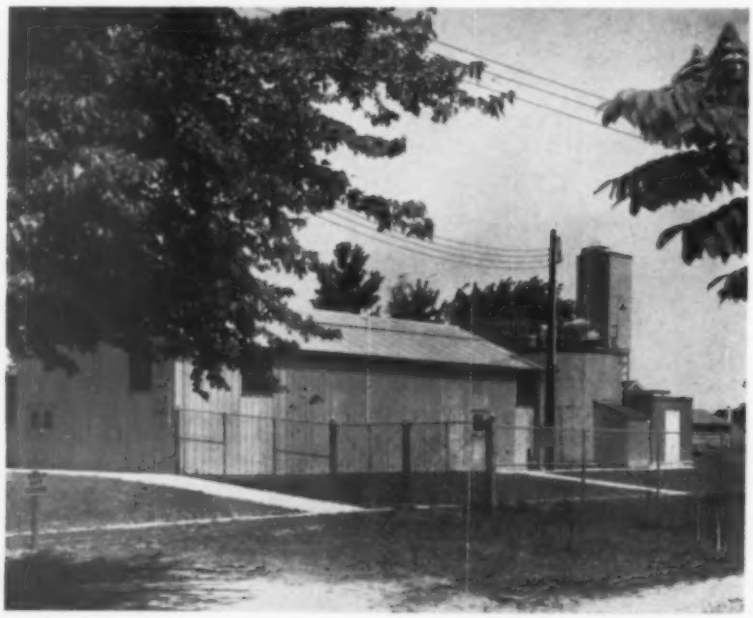
1. It has nearly constant temperature throughout the entire year. This ranges from 56°F in the southern part of the state to 50°F in the northern part. This compares with temperatures as high as 85°F attained in summer by some surface supplies.

2. It is generally colorless and free from organic matter, turbidity, and odors.

3. It is generally uniform in chemical composition.

4. Except under some rock conditions, it is invariably free from bacterial pollution.

Of course, in finding ground water the first step a driller goes through is to become familiar with the geology



GROUND WATER SUPPLY and treatment plant at Lower Penns Neck Township, N. J., includes 700-gpm well, forced-draft degasifier, up-flow sludge clarifier, filter for removing 12 mg/l of colloidal iron, and correcting for low pH and high CO_2.

of the area in question, particularly paying attention to records of wells drilled in the area. He gets this information from his own experience, from the U. S. Geological Survey, or from the State Geologist.

If the area is one in which rock is involved, or there is a glacial sand area or a marine sand area near the outcrop so that conditions are spotty, test drilling probably will be indicated, especially if large quanties are needed. It used to be that test wells were installed in rather large numbers, sometimes at considerable expense. A way has not been found to eliminate the test well, but a relatively inexpensive way has been found to minimize the number required. This involves electrical earth resistivity measurement, another field in which the well driller has become involved—that of the geophysicist.

Not only does this method effect a saving of test-holes, because useless test-drilling is a common fault of random drilling, but it also results in the most advantageous location of the final well or wells.

In the random method of site selection, the permanent well usually is drilled at the first location showing some water-bearing formation, when a much better site might have been available nearby which would have been discovered by the resistivity method.

ELECTRICAL LOGGING machine being used to log an 8-inch diameter uncased test well, held open by drilling clay.

The four-electrode method of measuring resistance is used. Electrodes consist of 5/8-inch steel rods driven into the ground to a depth of about 2 feet. Insulated cables connect these electrodes to the instrument panel. Two of the electrodes serve as points of entry and exit for the current, the other two to measure the resultant voltage drop in the earth. Current is supplied from a 90-volt source. An amplifier renders the measuring signal audible to the operator even in the presence of background noise. A special design of instrument permits direct reading of earth resistance in ohms.

The spacing of the electrodes controls the effective depth of penetration of the current. The resistivity measurement for a given spacing of electrodes is in the form of a weighted average of all the resistivities from the surface down to the effective depth of peneration. By systematically increasing the electrode spread, keeping the center fixed, it is possible to obtain information concerning the actual resistivity within a specified depth interval.

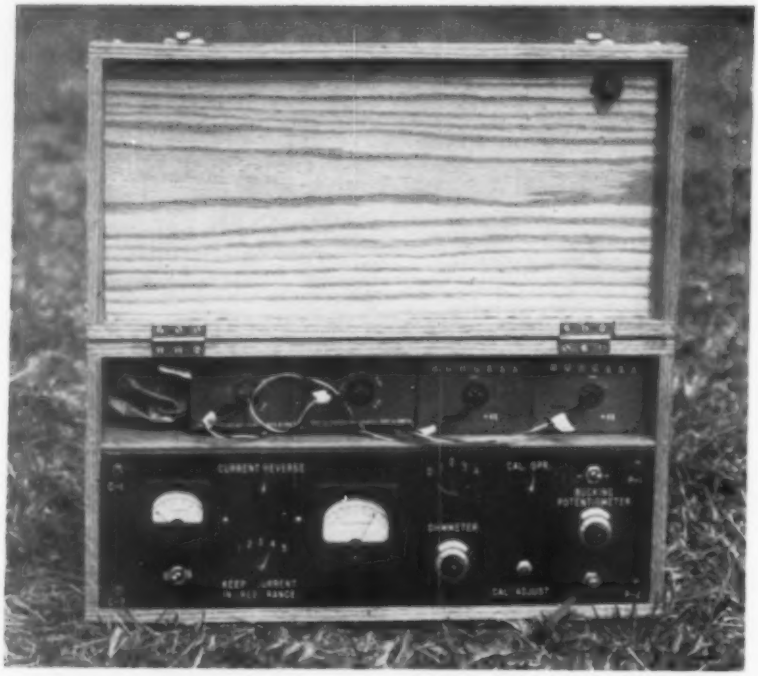
By repeating this technique at a number of stations distributed over the area under survey, one can prepare a map showing the areal distribution of subsurface resistivity. The values of subsurface resistivity are entered on a map at their respective stations. The resultant field of numbers may then be contoured, much as one contours data on elevation. Closures of high resistivity are indicative of highest sand or gravel content and represent the most favorable area for test-drilling.

Electrical resistivity surveying is the modern method of eliminating the expense of unnecessary test wells yet locating producing wells most favorably within a given area. It represents the application of sound scientific principles and techniques to the increasingly difficult problem of finding new, large-scale water supplies for municipalities and industries.

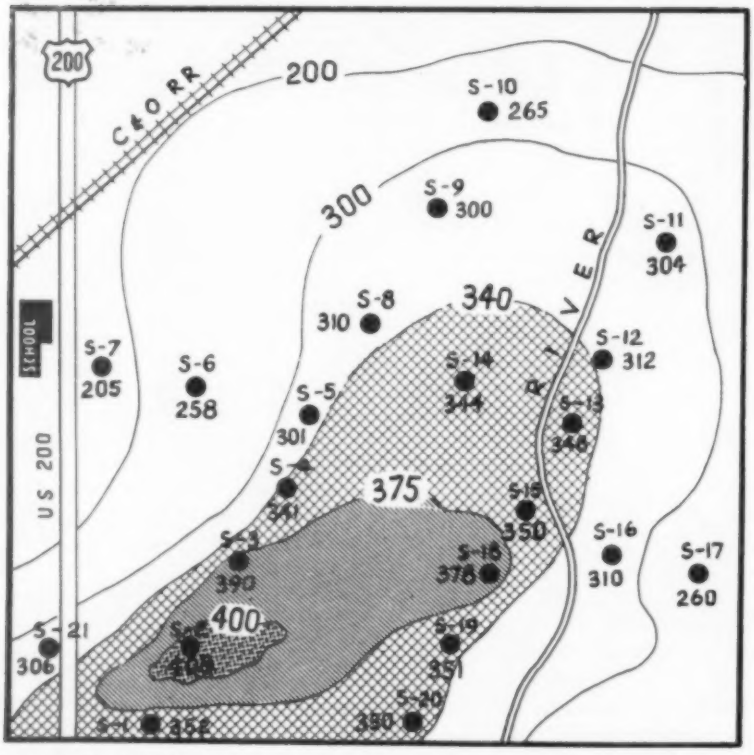
It may be of interest to indicate the resistivity of various geological materials the well driller encounters.

The ranges of resistivities to be expected for a number of commonly occurring rock types are given in the folowing table. It is understood that the rock is saturated with water in the potable range of chemical content. Of course, gradations from one rock type to the other will have intermediate resistivities.

Rock Type	*Resistivity, ohm-ft*
Glacial or alluvial clay	20 to 200
Glacial sand or gravel	350 to 1,000
Shale	20 to 300
Sandstone	500 to 1,000
Limestone	1,000 to 5,000
Igneous rocks	2,000 and up



EARTH RESISTIVITY machine used in electrical resistivity surveying to eliminate the expense of unnecessary test wells.



RESISTIVITY MAP shows the area disposition of subsurface resistivity. Closures of high resistivity are indicative of highest sand or gravel content and represent the most favorable area for test drilling.

After a survey of this nature has been completed the driller can proceed at the most advantageous sites with test drilling. If he is the modern driller described herein, he will probably tackle his drilling job, both test and permanent well, with rotary equipment. It used to be that rock drilling was all done by cable tool equipment. In fact, it was many years before this type of equipment gave way to rotary equipment in the drilling of wells in sand and gravel. However, straight rotary, reverse rotary, or air rotary, dominate the drilling scene today, at least for the larger type of project.

It might be added that air rotary equipment is confined to small-diameter rock holes (6 inches and smaller), whereas larger diameter rock holes (some up to 60 inches, used for mine shafts) are accomplished by reverse rotary, rotary clay seal drilling, or sometimes by shot coring using rotary equipment. Straight rotary clay seal or reverse rotary methods are used in the development of ground waters from the glacial and marine sands and gravels.

Having drilled the test hole, especially if in search of water-bearing sands and gravels above bed rock, the modern driller will now electrically log his well. The electrical logging of water wells is one of the more recent advances in the development of large-scale ground water supplies. It depends upon the fact that each type of earth material has its own characteristic electrical resistivity. For example, clay is electrically low-resistant, whereas sand or gravel, even when saturated with water, is high-resistant.

The aim of the electrical log is to provide a record of resistivity in the formation surrounding the drill hole, foot by foot down the hole. This information is recorded in the form of a graph showing resistivity versus depth, so that a picture of the various layers with differing resistivity is readily obtained. When graphs of a number of wells drilled in the same general area are placed side by side, it is possible to trace a given formation from well to well, revealing any change in the thickness, character, or depth of the formation.

Electrical logging must be done in an uncased hole. It cannot be done in a cable tool hole where the hole will

not stand open and a steel casing is used.

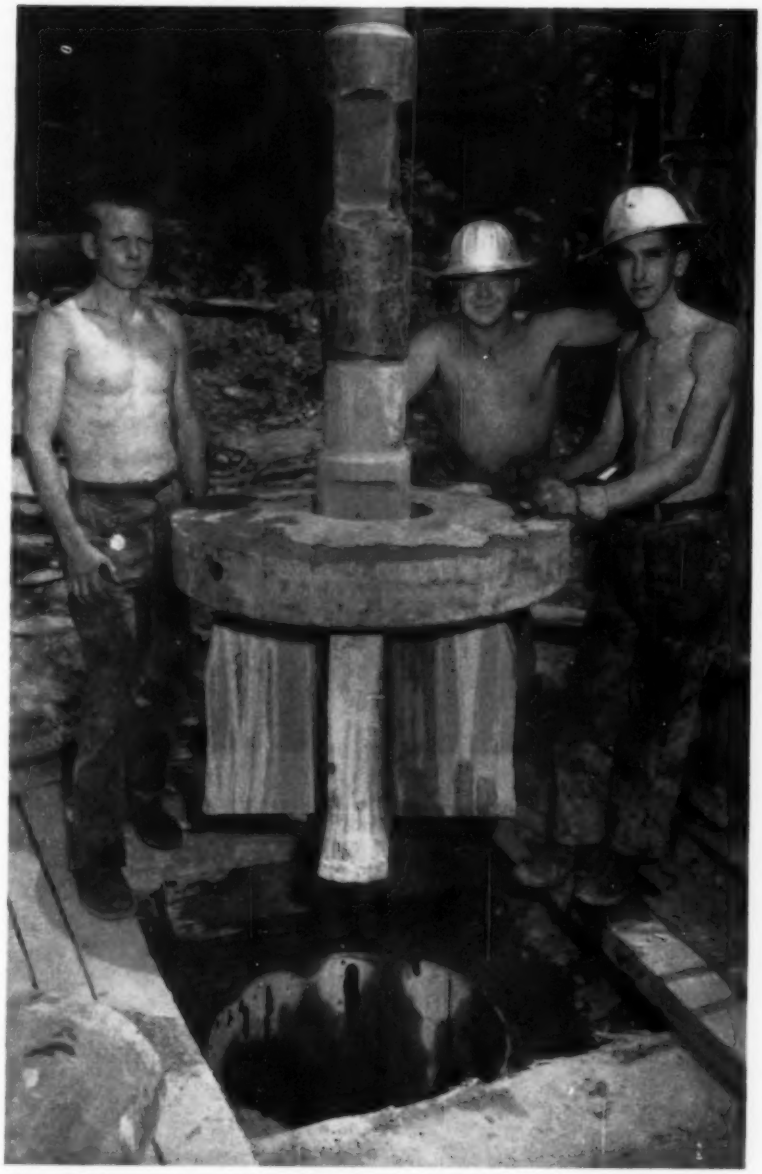
The most frequent use of electrical logging is in connection with rotary drilling methods. This method of drilling is fast and economical, and can operate in loose earth as well as in rock. Its principal source of error lies in the fact that the drill cuttings suffer mixture and delay in coming to the surface. The electrical log eliminates the error due to mixture and provides an accurate record of the formations penetrated by the drill.

The electric log provides a record of the nature of the undisturbed formation. Not even the cable tool method of collecting samples does this. Furthermore, it provides a numerical "rating" of the formation that will be the same, regardless of who makes the log. This is in contrast to the word description used in a log made from samples. No two drillers describe the same sample exactly alike. It is of great help in positioning the well screen in the well.

Electrical logging provides a permanent record of subsurface conditions in the well field. It is a guide for any future expansion of the field or for maintaining production from the present wells. Used in conjunction with surface resistivity surveys, the combination becomes the most economical means of exploring the ground for water. These are the two most scientifically sound and effective tools known today for attacking a ground water problem.

The driller is now ready to go ahead with a permanent well if his testing has been satisfactory. In fact, if one well will suffice, that may be all that is necessary to complete the job other than to equip the well with pump and motor (assuming no treatment is necessary). However, if several millions of gallons per day are necessary still more testing may be needed and an aquifer performance test is in order. If so, a producing well must be put on the line and one or more observation wells drilled to establish the cone of depression, or influence, of the operating unit.

Efficient use of a water-producing formation demands more than merely installing wells at random and pumping them. It is necessary to know what the effect of continued long-term pumpage will be on the water level in the wells. It also is necessary to know how much the pumpage of a given well will interfere with neighboring wells, either already installed or expected to be installed in the future. In short, it is necessary to know the principal characteristics of the water-bearing formation.



DRIVE HEAD used for driving 36-inch casing on the Allegheny County Sanitary Authority job at Pittsburgh.

A water-producing formation, known technically as an "aquifer," is characterized by its ability to transmit water to a well screen from a great distance (transmissibility); by its ability to store water (storage coefficient); and by the nature of its lateral boundaries (that is, whether the water-transmitting formation "pinches out" or whether it merges into better formation, or even has contact with an open body of water such as a lake or stream). These characteristics of an aquifer may be measured by means of carefully controlled "pumping tests."

The well-planned aquifer performance test has three distinct phases. The first is the "rest period." During this time the water levels in all wells are closely observed to see whether there is any outside influence causing them to change and, if so, how much they change.

The second phase is the "pumpage

period." During this period a single well is pumped at uniform rate from 12 to 72 hours, depending on aquifer conditions. Observations are made in all nearby wells to observe how the water levels behave as the pumpage continues.

The last phase is the "recovery period." The pump is shut down and records are kept of the rates of recovery in the nearby wells. Analysis of the data is patterned after recent researches of the Groundwater Division of the U. S. Geological Survey.

The scope of an aquifer performance test may be very elaborate or quite simple, depending on the information which must be obtained regarding the aquifer. In the case of an undeveloped aquifer, the owner needs to know the number and the capacity of wells he may install without exceeding the ability of the aquifer to furnish water over long periods of time. In such cases a temporary pumping unit would be installed and test wells drilled around it in a specified pattern.

If the aquifer is large, such a test would probably be repeated at two or three selected locations in the expected well field. Not until the analysis of these tests is completed should any permanent well installation be attempted.

In some cases a well field has been operating for some time before the need for expansion of the field arises. Under such conditions one of the existing wells is selected to be test-pumped and observations are made in the surrounding wells. Possibly a few additional test wells will be needed for observation points. The results of such testing can tell the customer whether the aquifer can be expected to support additional wells and at what distance they must be from those already installed.

In the simplest form the aquifer test makes observation only in the pumped well. From such testing it is possible to predict the effect of continued pumpage upon the water level in the well and thus to establish safe pumping rates. The test may also be designed to yield information with regard to screen losses. When so used it is of service in showing when sufficient development of the screen has been made.

From the standpoint of cost and information to be obtained, one pumped well (which may be a well now in service) plus one pilot well 50 to 100 feet away will probably provide the most information of this type for the least cost.

Thus, it is apparent that the well driller today is also a hydrologist. Some of the larger companies are able to compile their own aquifer performance tests, others have allied themselves with well-known men in this field.

It is beyond the scope of this paper to go into great detail about the construction of permanent wells. However, it may be of interest to consider briefly the advantages of the under-reamed well. This practice is helpful in developing the ultimate specific capacity of a well screened in sand and gravel formations above rock.

A well generally is under-reamed to the diameter of 24 to 32 inches depending on the size of the outside casing and the amount of water to be developed. This makes it possible to place a gravel filter uniformly around the well screen by hydraulic means. The size of the gravel is chosen after examining the range of coarseness of the water-bearing sand and gravels.

The opening in the well screen is chosen to work with the gravel used. Together they accomplish the purpose of allowing the water to enter the intake area of the well (the screen) at the lowest velocity possible, with the least amount of friction loss, and without carrying sand, the later being filtered out in the gravel filter.

Such a well can be maintained at top production by periodic cleaning. The old tubular well with single casing and wire-wrapped screen up against the formation does not have the specific capacity of the under-reamed well; it usually pumps sand and is relatively short-lived.

Some cable tool drillers may disagree with this whole discussion of rotary versus cable tool drilling and the end results. It is not intended to start a controversy or to minimize the importance of the cable tool driller. Cable tool drillers far outnumber the rotary drillers and no doubt drill many more times the actual number of holes drilled by the combined rotary drillers. It has been mentioned previously that this discussion is pretty well confined to the larger projects, but not always. In fact, as will be seen later, the Layne organization still owns a number of cable tool rigs and uses them profitably.

It was pointed out earlier that the modern water supply contractor becomes involved in special jobs. One of these involved the Layne organization as subcontractors to the general contractor to the Allegheny County Sanitary Authority and the job consisted of construction of vertical connections between the existing sewers and a new tunnel interceptor approximately 100 feet deep in rock.

At present all of the storm and sanitary sewage in Allegheny County, which includes Pittsburgh, discharge into the Allegheny, Monongahela and Ohio Rivers. Many of these sewers were installed before the river pool elevation was raised by control dams and discharge into the river as much as 40 feet below ground level.

None of the sewers discharge at the same elevation and construction has taken place along river frontage, which meant that a surface cut for the interceptor or main line would be practically impossible. The three rivers are underlain with alluvium deposits and a tunnel above rock would be impractical. The Authority decided to tie all existing sewers into a common header along the three rivers and allow gravity flow to a treatment plant located on the Ohio River.

The sewage will flow into a large vault-like installation, called a diversion structure, at each individual existing sewer end. The diversion structure is constructed to permit flow of sewage down the drilled shaft into the main interceptor. During periods of rainfall the diversion structure diverts storm water to the river.

Construction work by Layne-New York consisted of 112 holes ranging from 20 to 48 inches in diameter. Formations consisted of roughly 20 feet or river bank fill, 50 feet of sand and gravel, and 30 feet of hard sandstone rock. All holes were cased to full diameter to rock, with an open hole drilled through rock to the elevation of the tunnel. Upon completion of drilling operations a thick-walled wrought-iron pipe 12 inches less in diameter than the cased hole size was installed. The void between the wrought-iron pipe and the open rock hole or casing was filled with tremied concrete from the tunnel to the elevation of the existing sewer.

The work was undertaken with as many as five cable tool rigs and one rotary rig on the job at one time. Straight holes, a good concrete job,

and good scheduling of the work were of prime importance to the general contractors on both ends of the downshaft. This contract involved several hundred thousands of dollars.

Another interesting job was performed at Williamsport, Pa. A river in flood exerts an overturning action on dikes erected to confine it. To prevent dike failure, relief wells are often drilled in back of the dike. At Williamsport wells were installed for this purpose. Some 123 wells having an average depth of about 40 feet were drilled with 18-inch casing to the bottom of the water-bearing formation. In this casing 12-inch Armco asbestos-bonded perforated corrugated pipe was installed, with graded river gravel added as a gravel wall between the screen and the 18-inch pipe. The 18-inch casing then was pulled back and left in as a seal through upper impervious strata.

Upon completion of drilling operations, the wells were developed with a vertical turbine pump and tested at maximum capacity that ranged from 250 to 700 gpm. The job was a complete success and it was later reported that during a period of high water in the river, some of the wells flowed as much as 400 gpm.

In the building of the new Walt Whitman Bridge, which crosses the Delaware River from South Philadelphia, Pa., to Gloucester City, N. J., the problem was to dewater so that the cable anchorages on each side of the river could be built.

Five wells were installed around the area to be excavated on each side of the river. This area was approximately 100 feet wide and 200 feet long. The water table was pulled down to a depth of 90 feet below the ground surface by pumping these wells and held there for several months while the area above was excavated and the anchorage built under dry conditions.

Another project performed by a large Pennsylvania drilling concern was the drilling of 52-inch diameter mine shafts in solid granite, to the depth of 350 feet. This is being done for the Sun Oil Company at Chester, Pa. Many oil companies all over the country are storing low-volatile petroleum products in underground storage compartments, usually mined out of hard rock.

Drilling companies are called upon to drill the large-diameter mine shafts and the smaller-diameter air holes. This is difficult work and the methods and equipment used by the drilling industry can be improved. Plumbness is especially important, because high-speed mine elevators are installed in these shafts.

Lastly, the well driller must be somewhat of a metalurgist. It behooves him to know generally about the characteristics of the vertical turbine pump, which he uses every day. However, when he is called in to consult with a Pennsylvania coal mining company in regard to dewatering the highly acid water of a coal mine, he also must know a good deal about the materials that the pump should be built of to give lasting service under these adverse conditions. Due to its great versatility, the vertical turbine or deep well pump has gained much favor in this usage.

Such is the complex life of the modern well driller.

Pittsburgh Sewage Treatment Plant to Burn Sludge with Coal

Pioneer Station to Control Area Stream Pollution

After nearly 45 years of studies and reports, the City of Pittsburgh and 69 of its suburban municipalities have united to begin the construction of a $100,000,000 sewage treatment facility which will collect and treat the sewage and industrial wastes that are currently contaminating the streams in the Pittsburgh area.

One of the most unusual features of this project, which is being constructed under the direction of the Allegheny County Sanitary Authority, will be the method of sludge disposal. Developed in the Authority's laboratories and pilot plant, this method entails concentrating the raw sludge for 5 days and then incinerating it. A three year series of tests has demonstrated that when raw sludge is preheated to 95°F and stored for a period of 3 to 5 days, it will produce a concentration averaging 18 percent total solids by flotation. The concentrated sludge will then be mixed with a fine coal (slack), as this method of disposal requires a supplemental fuel for combustion, before being applied to the furnaces.

Ten concentration tanks will make up this system, with one-half of one tank to be used as a raw-sludge compensating tank to serve the pre-heaters. The tanks will have a total capacity of 3,250,000 gallons to handle the estimated average volume of 144,000 gpd with its moisture content estimated to vary from 76 to 84 percent. The tanks are designed with sawtoothed bottoms in section, with longitudinal screw conveyors for homogenizing and removing the concentrated sludge. Warm air will be circulated above the sludge in the insulated tanks and returned to the incinerators as combustion air, thus eliminating odors.

The sewage treating plant will have a peak operating capacity of 300-mgd and will provide for a 50 percent removal of B.O.D.

The sewer system will consist of 69.5 miles of intercepting sewer, of which 30.5 miles will be in deep tunnel. Six minor sewage pumping stations will serve branch interceptors. The main intercepting sewer system will conduct the flow by gravity to the central pumping station at the treatment plant.

Unusual features of the intercepting sewer system are the types of diversion works, including vertical drop-shafts to carry the intercepted sewage from the outfall sewers to the intercepting sewer; the method of operating the tunnel section of the intercepting sewer, as a flooded conduit under pressure; and the type of construction proposed for the intercepting sewer, in tunnel.

Water Lines Cool Electrical Lines

The Hydro-Electric Power Commission of Ontario, Canada, in laying its new underground power cables, separates each power cable with two ¾ in. polyethylene pipes. Through the plastic pipes will flow city water, supplied by the municipal water mains, to cool the power cables. This new system is expected to increase by about 50 percent the power-carrying capacity of the circuits.

Electronically controlled, so that the temperature of the power cables will never go higher than 185°F, the water is taken into the plastic pipe from the water mains and discharged into sewers about every 1,600 to 2,000 ft.

There are several methods which may be used to calculate the . . .

Yield of Impounding Reservoirs

EVERETT L. MacLEMAN, Professor of Civil Engineering at Yale University in New Haven, Conn., has gathered together for comparison, several approaches to the problem of determining the safe yield of impounded water supplies.

ONE OF THE EARLIEST procedures developed for estimating the yield from watersheds was presented in 1883 by Rippl.[1] Known to most engineers as the mass diagram method, it is still used extensively where runoff data are available.[2,3,4] However, in many cases runoff data have not been gathered for the particular stream under investigation. This situation resulted in the development of other methods. In 1892, FitzGerald[5] presented a procedure not requiring runoff data. His study was based on data from the Sudbury watershed in Massachusetts. A committee report in the New England Waterworks Association Journal[7,8] in 1914 presented another such method based on studies of several rivers in New England and New York. Excellent summaries of these two methods may be found in "Waterworks Handbook."[6]

In 1914, Allen Hazen's method was presented.[9] This procedure, which is based on statistical analysis, may be used with or without runoff figures. In the American Civil Engineers' Handbook,[10] information and tables are presented for use over the entire United States.

The increase in number of streams with sufficient periods of runoff record permits the engineer to make more frequent use of statistical analsis directly. One such procedure involving the use of the mass diagram will be presented later for comparison with the other methods.

These five stated methods will, in general, provide an engineer with a figure for the safe yield of a reservoir anywhere in the United States. FitzGerald's and the New England Waterworks Association's procedures, although not requiring runoff data, are, however, limited to the northeastern section of the country. Today there should be sufficient data available for the development of similar tables and graphs for any section. Of all the methods, only Hazen's is applicable to the entire United States with or without runoff data.

Where runoff data are not available the author has found Vermuele's[11,12]

TABLE 1

Storage Capacity Required to Sustain Constant Daily Draft from 1 Square Mile Containing Various Percentages of Water Surfaces[5,6]

(Based on Sudbury Watershed 1875-1890)

Constant Daily Draft, mg	Storage, mg per sq mi								
	0%	2%	4%	6%	8%	10%	15%	20%	25%
0.10	0.314	1.289	2.656	6.973	10.992	15.012	26.883	40.224	53.565
0.15	3.006	4.711	7.552	11.573	15.592	19.642	32.983	46.324	59.665
0.20	8.797	9.937	12.802	15.666	20.427	25.742	39.083	52.424	65.765
0.25	17.997	20.637	23.502	26.366	29.230	33.338	45.449	58.524	71.865
0.30	28.473	31.337	34.202	37.066	39.930	43.437	54.599	66.702	78.807
0.35	39.173	42.037	44.902	47.766	59.630	54.137	64.812	75.852	87.057
0.40	51.303	52.788	55.602	58.466	61.643	66.050	77.062	88.076	99.089
0.45	63.553	65.038	66.525	69.488	73.893	78.300	89.321	100.970	127.412
0.50	75.803	77.288	79.105	82.131	86.143	90.550	103.474	129.920	156.362
0.55	88.053	89.877	92.905	95.931	98.958	105.987	132.424	158.870	185.312
0.60	100.651	103.677	106.705	113.781	124.357	134.937	161.374	187.820	214.262
0.65	114.451	121.577	132.154	142.731	153.307	163.887	190.324	216.770	250.744
0.70	139.950	150.527	161.104	171.681	182.257	192.837	219.274	265.546	336.044
0.75	168.900	179.477	190.054	200.631	211.207	221.787	280.343	350.846	421.344
0.80	199.106	208.427	219.004	244.445	270.452	297.460	365.643	436.146	506.644
0.85	250.328	276.275	302.240	328.195	354.202	380.557	450.943	521.446	591.944
0.90	334.078	360.025	385.990	411.945	437.952	465.857	536.243	606.746	677.244

and Justin's [13] formulas to give a satisfactory mean annual runoff figure from rainfall data in the New England area.

It is the intent of this study to present a comparison of the five methods using the well-known dry period of 1878-1889 for the Sudbury River Basin as an example.

Sudbury River Basin near Framingham, Mass.

Total runoff for 12-yr period, 348,112 mg (Fig. 1 is a plot by months)
Drainage area, 75.2 sq mi.
Reservoir, volume of storage 10,000 mg, surface area 3.4 sq mi.
Hazen suggests a coefficient of variation of 0.27 with 25 days to be deducted for ground water storage.[10]
Using data for the 12-yr period, a coefficient of variation of 0.287 is obtained (see Table 3.
For reservoir surface evaporation, Hazen suggests 6 in. plus 50% for shallow reservoirs.[10]
Thus, surface water evaporation would amount to

$$\frac{6+3}{12} \quad \frac{3.4\times640\times43{,}560}{1{,}000{,}000} \quad 7.48=532 \text{ mgy}$$

Available storage=10,000—532=9,468 mg

Computation of Yield by Various Methods

A. Rippl (Mass) Diagram

From Figure 1 (a plot of accumulative monthly runoff), by use of available storage we obtain maximum yield for each year (i.e., minimum slope).

Critical year, 1880—Yield available, 19,100 mgy, or 52.4 mgd.

Critical period, June 1882-Dec. 1883—Yield available, 17,992 mgy, or 49.3 mgd.

B. Desmond FitzGerald

$$\% \frac{\text{Water Surface (mi}^2\text{)}}{\text{Watershed (mi}^2\text{)}} = \frac{3.4}{75.2} \times 100 = 4.52\%$$

$$\frac{\text{Storage (mg)}}{\text{Watershed (mi}^2\text{)}} = \frac{9468}{75.2} = 126 \text{ mg/mi}^2$$

From Table 1[5, 6] by interpolation,

4%	4.5%	6%
106.705	108.545	113.781
(0.633)	126	
132.154	134.904	142.731

Yield available = 0.633 mgd/mi² x 75.2 mi² x 365 d/y = 17,400 mgy, or 47.7 mgd.

C. Comparison with Other Rivers—N.E.W.W.A.

Using figures obtained for the FitzGerald method and Figure 2[6, 7] we obtain 0.710 mgd/mi².

Yield available = 0.710 mgd/mi² x 75.2 mi² x 365 d/y = 19,500 mgy, or 53.4 mgd.

Although these methods (FitzGerald and N.E.W.W.A.) apply only to New England, similar tables and curves may be developed for other areas.

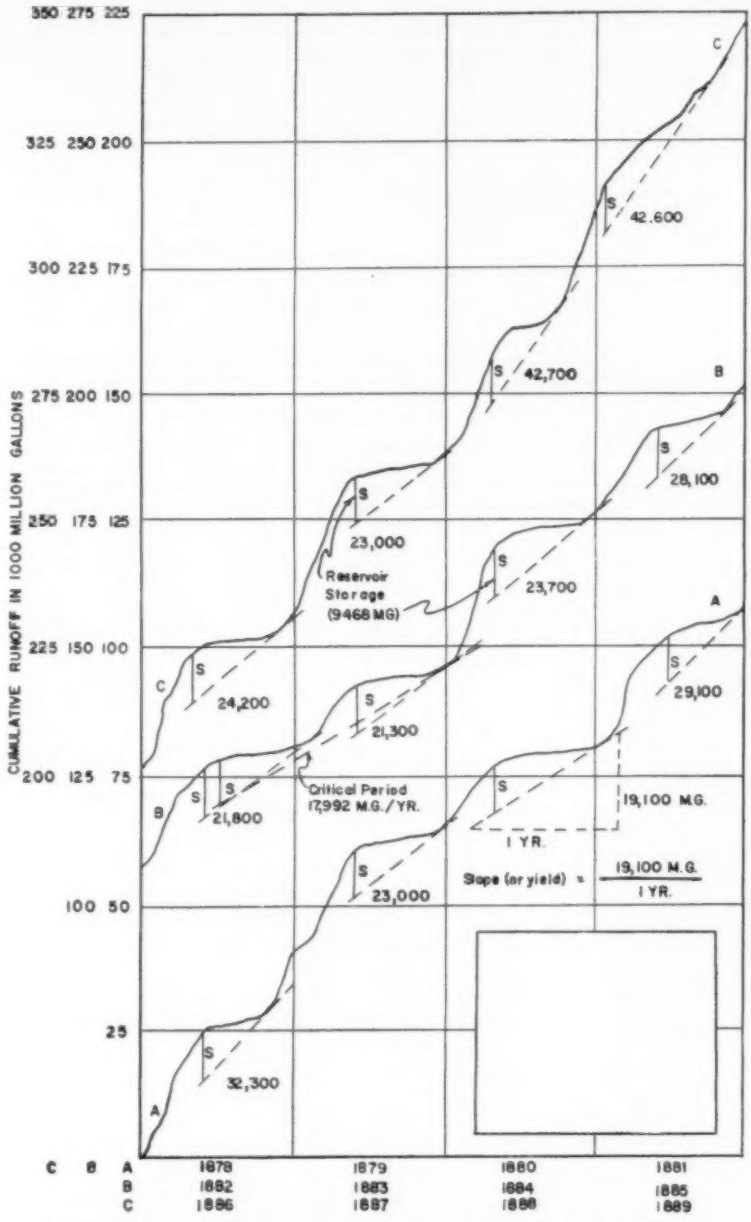


Fig. 1—RIPPL (mass) diagram for Sudbury River Basin at Framingham, Mass. (Jan. 1, 1873-Dec. 1, 1889)

D. Allen Hazen

Mean annual flow (for years of record, 12 yrs) $= \frac{348{,}112}{12} = 29{,}000$ mgy.

$$\text{Storage ratio} = \frac{\text{Available Storage}}{\text{Mean Annual Flow}} = \frac{9{,}468}{29{,}000} = 0.327$$

From Table 2[10] (by interpolation),

% of Mean Flow Available	C_v 0.26	C_v 0.27	C_v 0.28	Deduction for Gd. Water Storage 30 Days	Deduction for Gd. Water Storage 25 Days	C_v 0.27
65	0.37	0.38	0.39	0.053	0.044	0.336
(64.14)						0.327
60	0.32	0.325	0.33	0.049	0.041	0.284

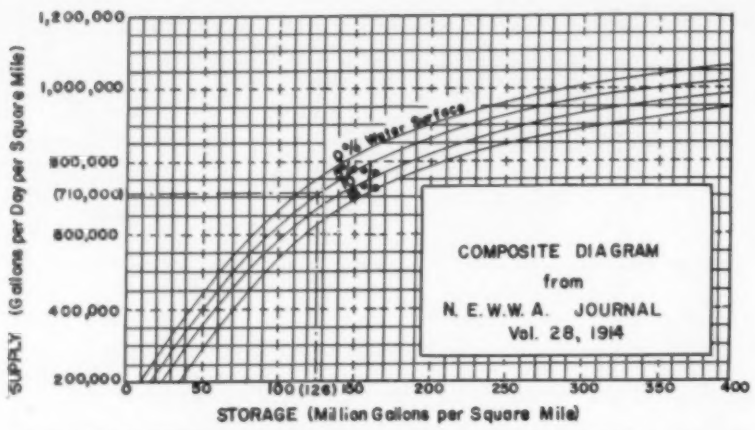


Fig. 2—COMPOSITE diagram (from N.E.W.W.A. Journal, Vol. 28, 1914) showing storage capacity required to supply various quantities of water daily from 1 square mile of drainage area containing various percentages of water surfaces. (Based on 11 drainage areas in New England and New York.)

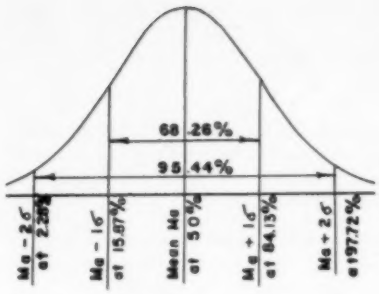


Fig. 3—NORMAL or bell-shaped distribution curve

Yield available = 29,000 (0.6414) = 18,600 mgy, or 51.0 mgd.

Using runoff data, a coefficient of variation of 28.7 is obtained (Table 3).

Yield available = 29,000 (0.63) = 18,270 mgy, or 50.05 mgd.

E. Application of Statistical Methods to the Mass Diagram

The basis for a statistical analysis for the type of data obtained from rainfall and runoff is the normal distribution of natural phenomena in the universe. For example, the mean of some series, such as the number of sunny days each year, will lie in the middle of the series, and there will be fewer and fewer years in which the number of sunny days different from the mean become increasingly larger or smaller than the mean. This leads to a normal or bell-shaped distribution curve (Figure 3). A common measure of this type of curve is the standard deviation

$$\sigma = \sqrt{\frac{v^2}{n-1}}$$

in which n is the number of terms and v is the variation from the mean. A range of the mean $\pm$ 1 σ will include 68.26 percent (15.87% and 84.13% inclusive) of the series and the mean $\pm$ 2 σ will include 95.44 percent (2.28% and 97.72% inclusive). This type of analysis will be exact only if an infinite number of items is included in the series, but it may be applied to representative series with fairly accurate results.

For further information on statistics as applied to sanitary engineering the reader is referred to the work of C. J. Velz.[14]

(a) Arithmetic—From Figure 1 obtain the yearly allowable yields and arrange in ascending order (Table 3). Compute the arithmetic mean, standard deviation, and coefficient of variation. For a complete graphical plot the theoretical "percent less than" for each of the items in the series should be computed.

TABLE 3

Item No. (n)	Yield (X), 1,000 mgy	v = X-M_o	v^2	% Less Than
1	19.1	8.5	72.3	4.17
2	21.3	6.3	39.7	12.50
3	21.8	5.8	33.6	20.8
4	23.0	4.6	21.2	29.2
5	23.0	4.6	21.2	37.5
6	23.7	3.9	15.2	45.8
Mean				
7	24.2	3.4	11.6	54.2
8	28.1	0.5	0.25	62.5
9	29.1	1.5	2.25	70.8
10	32.3	4.7	22.1	79.2
11	42.6	15.0	225.0	87.5
12	42.7	15.1	228.0	95.8
	330.9	73.90	692.40	

TABLE 2

East of the Mississippi River[10]: Also Oregon and Washington

High and Complete Developments: Reservoir not refilling each Winter. Relative Variation in Annual Flows Measured by the Coefficient of Variation Used as the Second Line of Classification

Per Cent of Mean Flow Avail.	Storage Ratio									Deduction for 30 Days' Ground Storage
	c.v.= 0.20	c.v.= 0.22	c.v.= 0.24	c.v.= 0.26	c.v.= 0.28	c.v.= 0.30	c.v.= 0.35	c.v.= 0.40	c.v.= 0.45	
95	1.21	1.33	1.46	1.60	1.74	1.90	2.30	2.70	3.10	0.078
90	0.85	0.92	1.00	1.09	1.20	1.31	1.60	1.88	2.20	0.074
85	0.66	0.71	0.77	0.83	0.91	1.00	1.23	1.47	1.70	0.070
80	0.54	0.57	0.61	0.66	0.71	0.78	0.97	1.19	1.39	0.066
75	0.45	0.47	0.50	0.53	0.57	0.62	0.77	0.95	1.13	0.062
70	0.39	0.40	0.41	0.44	0.47	0.50	0.62	0.76	0.92	0.058
65	0.35	0.35	0.35	0.37	0.39	0.41	0.50	0.61	0.74	0.053
60	0.31	0.31	0.31	0.32	0.33	0.34	0.40	0.49	0.60	0.049
55	0.27	0.27	0.27	0.27	0.28	0.28	0.33	0.39	0.49	0.045
50	0.23	0.23	0.23	0.23	0.23	0.24	0.26	0.32	0.39	0.041

$$\% \text{ less than} = \frac{n - \frac{1}{2}}{12} \times 100$$

For item No. 5:

$$\% \text{ less than} = \frac{5 - \frac{1}{2}}{12} \times 100 = 37.5$$

$$\text{Arithmetic mean} = M_a = \frac{\Sigma X}{n} = \frac{330.9}{12} = 27.58$$

$$\text{Standard deviation} = \sigma_a = \sqrt{\frac{v^2}{n-1}} = \sqrt{\frac{692.4}{12-1}} = 7.93$$

$$\text{Coefficient of variation} = \frac{\sigma_a}{M_a} = \frac{7.93}{26.58} = 0.287$$

In Figure 4, from the plot on arithmetic probability paper, the curve of best fit may be obtained by a line through the mean and the mean $\pm$ 1 σ: i.e., $M_a + \sigma_a = 35.51$ at 84.13% and the $M_a - \sigma_a = 19.65$ at 15.87%.

From the curve the yield for the 95% dry year may be obtained.

Yield available = 14,500 mgy, or 39.8 mgd.

This may also be computed through the use of Table 4.[15] To determine the yield for the 95% dry year, find the number of standard deviations from the mean which will include 45% of all items. From Table 4[15] it is 1.645: that is, 1.645 (σ_a) = 1.645 x 7.93 = 13,000 mgy. Subtract this from the mean to find the yield for the 95% dry year. (The remaining 50% lies above the mean.)

95% Dry Yield = $M_a - 1.645\ \sigma_a$ = 27.6 — 13.0 = 14,600 mgy, or 40 mgd.

Discussion—From an examination of the data it is seen that items 11 and 12 are out of line. This will tend to result in a skew curve rather than the normal bell-shaped curve. These two items greatly increase the standard deviation and affect the mean to a lesser degree. If the last two years of record are dropped, the mean is 24,560 mgy and the standard deviation is 3.94. This gives a yield of 18,100 mgy, or 49.6 mgd, which compares well with the other methods. In the foregoing case it was simple to determine which items should be dropped; in others it might not be quite as easy a task. For such cases it is convenient to make a geometric analysis.

(b) Geometric—The geometric mean, like the arithmetic mean, is a mathematical rather than a positional average; as such, the value of each item in a series enters into the determination of the geometric mean. Less weight is given to the extreme values when the geometric mean rather than the arithmetic mean is computed, so that the geometric mean will always be a lower value than the arithmetic. It should be used when series are limited in one direction and unlimited in the other. The geometric standard deviation (σ_g) is a ratio between the value of a series which will be greater than 84.13% of the items, and the geometric mean (that is, $\sigma_g\ M_g$ = value for which only 15.87% of the series is greater; $\frac{M_g}{\sigma_g}$ = value for which only 15.87% of the series is smaller).

$$\text{Geometric mean} = M_g;$$

$$\log M_g = \frac{\Sigma \log X}{n} = \frac{17.114}{12} = 1.4260.$$

$$M_g = 26{,}700.$$

$$\text{Standard deviation} = \sigma_g;$$

$$\log \sigma_g = \sqrt{\frac{\Sigma \log^2 X}{n-1} - \frac{n \log^2 M_g}{n-1}}$$

$$\log \sigma_g = \sqrt{\frac{24.5428}{11} - \frac{12 \times 2.0335}{11}} = \sqrt{0.0128} = 0.1131$$

$$\sigma_g = 1.287.$$

In Figure 5, when the mean is plotted at 1.00,

$$1.00 \times \sigma_g = 1.298; \frac{1.00}{\sigma_g} = 0.771$$

In Figure 5, from the plot on logarithmic probability paper, the curve of best fit may be obtained by a line through the geometric mean plotted as 1.000, and 1.000 divided by and multiplied by the geometric standard deviation.

From the curve, the yield for the 95% Dry Year may be obtained. Ratio = 0.665; yield = Ratio $\times$ M_g = 0.665 $\times$ 26,700 = 17,760 mgy, or 48.7 mgd. This result approximates very well that obtained by the first four methods. For a series with a greater number of observations, calculations may be reduced considerably by grouping. An example of this has been presented by Fair and Geyer.[16] Where electronic digital computers are available, statistical procedures such as these may be programmed.

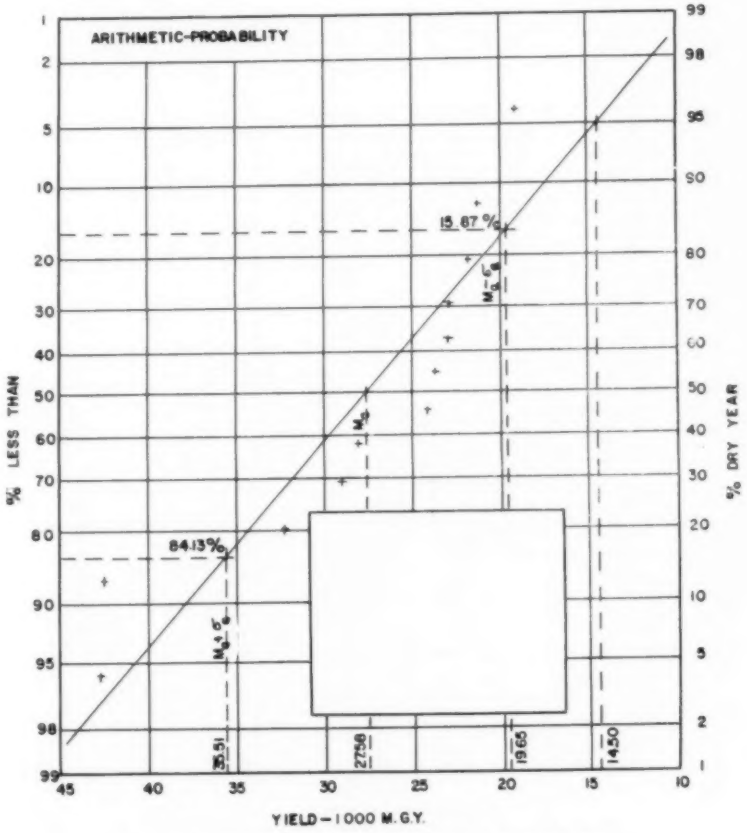


Fig. 4—STATISTICAL analysis, arithmetic plot, Sudbury River (Jan. 1, 1878-Dec. 31, 1889)

TABLE 4
Area of Normal Curve from Mean to Indicated Deviation from Mean[15]

	Final Digit of $\frac{x}{\sigma}$ and Area									
	0	1	2	3	4	5	6	7	8	9
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936

Summary

	Yield Available MGY	MGD
A. Mass Diagram:		
Critical year, 1880	19,100	52.4
Critical period, June, 1882-Dec., 1883	17,992	49.3
B. Desmond FitzGerald	17,400	47.7
C. Comparison with Other Rivers (N.E.W.W.A.)	19,500	53.4
D. Allen Hazen:		
c.v.=0.27 (from Hazen tables)	18,600	51.0
c.v.=0.287 (from run-off data)	18,270	50.0
E. Application of Statistical Analysis to Mass Diagram:		
(1) Arithmetical:		
(a) Graphical	14,500	39.8
(b) Tabular	14,600	40.0
(c) Dropping extremes	18,100	49.6
(2) Geometrical:		
(a) Graphical	17,760	48.7

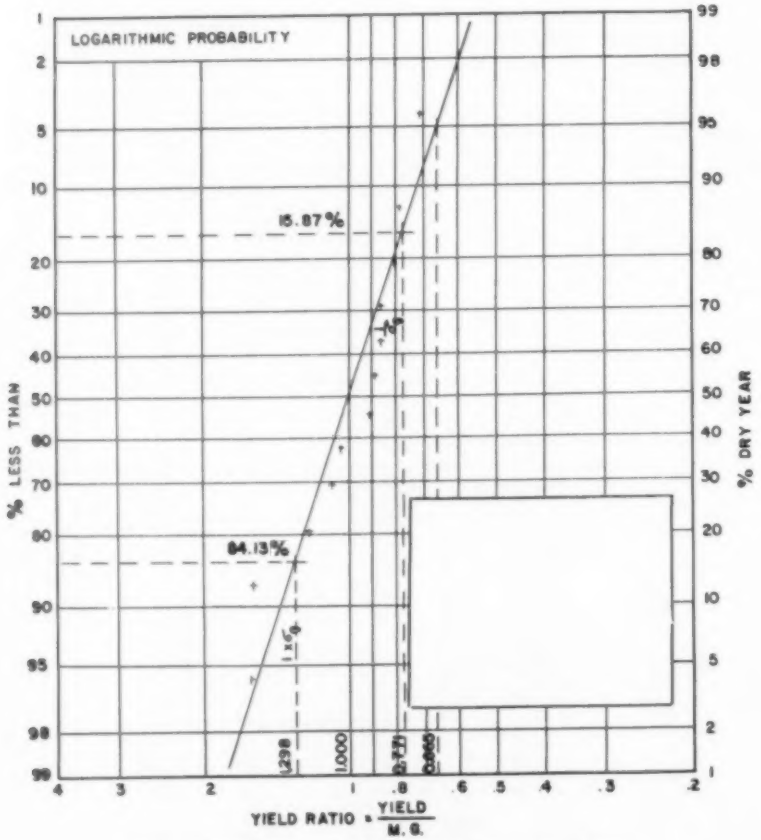


Fig. 5—STATISTICAL analysis, geometric plot, Sudbury River (Jan. 1, 1878-Dec. 31, 1889)

Conclusion

With the exception of the arithmetic statistical procedure, which has already been discussed, all the methods provide comparable results. The 5.7-mgd spread between the extremes does not appear excessive for such a large watershed. Application of the FitzGerald, N.E.W.W.A., and Hazen procedures to a small drainage area of 1.63 square miles in the northwest section of Connecticut provided the following values: 0.71, 0.77, and 0.72 mgd, respectively. It was later learned that twice there was a water shortage when a 0.75-mgd rate of withdrawal was maintained. The N.E.W.W.A.'s comparison with other rivers tends to be generally on the high side. This might be due in some part to the size of the curves and the change in watersheds since the study was made.

As stated earlier, the foregoing methods, with other factors such as the geology and character of the watershed, should provide an engineer with sufficient information upon which to base his estimate.

References

1. Rippl, W., "The Capacity of Storage Reservoirs for Water Supply." *Proc. Inst. C. E.*, Vol. 71, p. 270 (1883).
2. Freeman, J. R., "The Hetch Hetchy Water Supply for San Francisco." Rincon Pub. Co. (1912).
3. Horton, R. E., "A Form of Mass Diagram for Studying the Yield of Watersheds." *Eng. Record*, Vol. 36, p. 185 (1897).
4. Butcher, W. L., "Mass Diagrams for Power and Water Supply Computations." *Eng. News*, Vol. 76, p. 376 (1916).
5. FitzGerald, D., "Rainfall, Flow of Streams and Storage." *Trans. A.S.C.E.*, Vol. 27, p. 253 (1892).
6. Flinn, A. D., Weston, R. S., and Bogert, C. L., "Waterworks Handbook, Impounding Reservoirs." 3rd Ed. McGraw-Hill Book Co., New York, N. Y. (1927).

7. Committee Report, "Yield of Catchment Areas." *Proc. N.E.W.W.A.*, Vol. 28, p. 397 (1914)
8. Committee Reports, "Rainfall and Yield of Drainage Areas." *Proc. N.E.W.W.A.*, Vol. 59, p. 285 (1945); Vol. 62, p. 310 (1948); Vol. 64, p. 398 (1950).
9. Hazen, Allen, "Storage to Be Provided for in Impounding Reservoirs for Municipal Water Supplies." *Trans. A.S.C.E.*, Vol. 77, p. 1539 (1914); Vol. 84, p. 214 (1921); Vol. 87, p. 142 (1924); Vol. 91, p. 622 (1927).
10. Merriman, T., and Wiggin, T. H., "American Civil Engineers' Handbook." Section 14, "Water Supply," by Allen Hazen. John Wiley & Sons, New York, N. Y. (1930).
11. Vermuele, C. C., "Report on Water Supply." Geol. Surv. of New Jersey, Vol. 3 (1894).
12. Turneaure, F. E., and Russell, H. L., "Public Water Supplies." 4th Ed., p. 80. John Wiley & Sons, New York, N. Y. (1948).
13. Justin, J. D., "Table of Flood Flows." *Trans. A.S.C.E.*, Vol. 77, p. 346 (1914).
14. Velz, C. J., "Graphical Approach to Statistics." *Water and Sewage Works*, Vol. 97, Nos. 5, 8, 10; Vol 98, Nos. 2, 6, 7. (Also in *Reference and Data*, 1952.)
15. Neiswanger, W. A., "Elementary Statistical Methods as Applied to Business and Economic Data." P. 708. The Macmillan Company, New York, N. Y. (1951).
16. Fair, G. M., and Geyer, J. C., "Water Supply and Waste Water Disposal." P. 113. John Wiley & Sons, New York, N. Y. (1954).

TABLE 5

Item No., *n*	Yield 1,000 mgy (X)	log X	$\log^2 X$	Ratio, X/mg	% Less Than
1	19.1	1.2810	1.6410	0.716	4.17
2	21.3	1.3284	1.7646	0.799	12.50
3	21.8	1.3385	1.7916	0.817	20.8
4	23.0	1.3617	1.8542	0.862	29.2
5	23.0	1.3617	1.8542	0.862	37.5
6	23.7	1.3747	1.8898	0.889	45.8
Mean					
7	24.2	1.3838	1.9149	0.907	54.2
8	28.1	1.4487	2.0987	1.054	62.5
9	29.1	1.4639	2.1430	1.091	70.8
10	32.3	1.5092	2.2777	1.211	79.2
11	42.6	1.6294	2.6549	1.597	87.5
12	42.7	1.6304	2.6582	1.601	95.8
		17.1114	24.5428		

Dunn Elected President Vertical Turbine Pump Assn.

F. E. Dunn, general manager, Turbine Pump Div., Worthington Corp., has been elected President of the Vertical Turbine Pump Association for 1958.

At the same time it was announced that Harold Miller, general manager of the Johnston Pump Div., Youngstown Sheet and Tube Corp., was elected Vice-President of the Assn., and B. A. Tucker, former sales manager (retired), Peerless Pump Div., Food Machinery and Chemical Corp., was appointed to serve as the Association's Manager for 1958.

Battelle Institute Conducting Water Resources Research

Robert C. Smith has joined the staff of Battelle Memorial Institute, Columbus, Ohio, where he will be in charge of water resources research conducted within the Institute's Department of Economics. In his new position, Smith will be chiefly concerned with research aimed at solving water resources problems, particularly as they relate to industrial, municipal, and area development.

Smith, a Univ. of Ill. graduate, brings more than ten years of field experience in the study of water problems with him to the Columbus, Ohio, research center. He was formerly Assistant Division Chief, Ohio Division of Water, in the Department of Natural Resources. Previously, Smith was employed with the United States Geological Survey's Water Resources Branch, and is the author of several papers on water resources published by the Geological Survey and the Ohio Division of Water. From 1954 to 1956, he served as secretary of the Governor's Advisory Committee on Ohio's Water Resources.

Rubber Plant Uses Sewage Plant Effluent

The Odessa Butadiene and General Tire Synthetic Rubber plant have recently opened at Odessa, Texas.

The two plants, representing an investment of $32 million, undobutedly would not have been located at Odessa had it not been for the fact that there is about 4 million gallons per day of sewage effluent water available. On-site well water or purchased water from the city of Odessa for processing would have a prohibitive cost in this area where annual rainfall averages 11 inches.

Water from the sewage disposal plant storage lagoon goes through a cold lime-soda ash reactor at Odessa Butadiene's plant. This reduces phosphate content below 1 ppm. Other treating brings water hardness to 160 ppm from about 400 ppm as it leaves the sewage disposal plant.

Water Pits of the Holy Land

Water has always been a valuable commodity in Palestine and there is a ring of reality in the stories of the struggles over a good supply. Abraham obtained water for his flocks and herds out of wells and pits.

The "well" was usually a spring and of paramount importance; the "pit" was a cistern excavated in the earth that collected the surface and rain water from the ditches and stored it up for use in dry spells. These chambers were often cut in the living rock. Isaac had all the wells and cisterns of his father cleaned out in order to improve the supply. Some of these had been filled in by the wicked Philistines when Abraham abandoned the land.

It was an abandoned water pit in the land of Dothan into which Joseph was thrust by his brothers. Pits were convient places for disposing of unwanted persons, living or dead. During the excavation of Tell-en-Nasbeh a water pit 2,600 years old was discovered and it contained a great number of skeletons. Jeremiah himself was cast into the water pit of Malchiah while he was incanate there. It was a dreadful mode of punishment.

A water pit discovered at Gerar was lined with sun-dried brick and the retaining wall was coped with blocks of stone. Another water storage cistern in the sands of Ur was lined with brick, coated with asphalt to render it watertight more than 4,000 years ago.

—*C. J. Robb, County Down, Ireland*

Public concern is the most encouraging sign regarding the adequacy of

Water Supply *for municipal service*

by JOHN H. MURDOCH, JR., Consultant to American Water Works Service Company Inc., Philadelphia, Pa.

CONCERN about local water supply was the substance of a talk given by Mr. Murdoch before the Statewide Water Supply Conference of the Illinois State Chamber of Commerce, Water Resources Committee in Peoria, Ill. Some of the problems and their solutions are presented here in this condensation.

■ THE MOST encouraging circumstance in the field of local water supply is that there is a widespread concern about it. If community and industrial leaders, state and local officials, business men, labor leaders and water consumers were perfectly satisfied about the adequacy of the local water supply to care for present needs and for needs foreseen, disaster would lie ahead. However, since there is concern—anxiety—about present conditions and the future, there is a realization of the need for action and there is, consequently, a probability that long-term problems will be solved. Complacency is the enemy of progress —concern is its harbinger. The quick and correct answer as to why the concern about local water supply is that most thinking people realize that water consumption is growing rapidly, that there are growing numbers of claimants on available supplies, that it takes years to develop new local sources of supply, and that something must be done now.

In this brief paper there will be mention of a few instances of personal experiences with local water supplies where there was a failure to provide for the future, with resulting hardship on consumers and losses to the business communities. The instances are chosen because they came within the writer's own experience and because they are representative and typical. Many more could be cited with reliance on published reports. The hardships resulting from the failure to make adequate provisions for growing demands prove the importance of a good water supply for all phases of the local economy. These instances of failure will be followed by a discussion of the function of a public water supply agency and of some of the major problems affecting them.

Supply Failures and Their Consequences

During the lifetime of the writer public water supply and health department officials have learned how to give to our urban population water which is safe to drink. Typhoid and other water-borne diseases have been practically eliminated where public water supplies are available. Prior to the early 1900's many public supplies were often highly dangerous to health, many times little if any better in quality than the common backyard wells and those wells were commonly sources of the recurrent and widely spreading typhoid epidemics. In fact, public supplies had little to commend them beyond convenience and the price of service was kept low to induce customers to take the poor service being offered. Today, with vastly improved service, officials have great difficulty in getting adequate financial support for the still better service now demanded because too many people still think that water should be cheap and that prices much higher than those based on the old dangerous conditions are exorbitant. Poverty traceable to this insistence on cheap water was the primary cause of the supply failures which will be mentioned and of the difficulties now met in building adequate systems.

Lack of Planning

In an eastern state one of the older, well established and prosperous communities had water supply difficulties beginning before 1890. The first public supply was drawn from a small creek, without storage, and it was soon found that storage of winter floods was essential to carry the load during the low stream flow periods. The storage provided would have been adequate in good rainfall years if there had been no growth of population and no new industries. The industries came, population grew, and rainfall was light. Result—periodic and long curtailments and even discontinuances of water supply. Industries were shut down, men were without work, all business suffered. At that time there were no health hazards

The function of a public water supply agency is to provide water, where, when and as needed.

involved because people never thought of drinking water from the public supply. They drank and took disease from the old familiar wells.

In 1900 a new organization took charge and correctly diagnosed the trouble. Greatly enlarged impounding reservoirs were created, a modern filter plant was built and waste of water was eliminated by putting all customers on a metered service basis.

False Economy

For reasons of economy only local engineering advice was secured for the supply system developments and long-term trends in growth of demand were not given adequate consideration. There were serious errors in calculations of reservoir capacities and failures to understand the effects of variations in stream flows with relation to required reservoir capacities to meet anticipated needs. With a supply safe for human consumption and with beautiful impounded lakes both domestic and industrial use expanded. The new supplies were adequate for twenty years of growth and —on the basis of the original and erroneous engineering figures—seemed good for several more years. There was no money available for expert advice on the adequacy of the supplies to meet growing needs. Then came disaster. Months of high demand—months of record breaking drought and continued reliance on figures of water in storage later found to be in error. At Christmas time state officials took charge of the situation. Water was allowed to flow from the distributing reservoir into the city for only four hours a day. A fixed minimum was maintained in that reservoir for fire service. All industrial use was prohibited. Only essential domestic and commercial uses were permitted. State inspectors tested all wells and in most cases sealed them as unsafe for use. Industrially the city was brought to a standstill. No one talked of anything but the lack of water and of their hardships. Old friends dodged water works officials to avoid telling them their hard opinions. Only after many weeks could the restrictions be eased and service restored to some approximation of normal.

Equitable Solution

After that, with the backing of local bankers and other business men, expert water works men were employed and retained; new storage facilities were built and service rates were increased enough to carry the added costs. When the president of the largest industrial user was approached about the proposed increase in rates he studied his figures of increases in water expense to him and then stated that the increases would be infinitesimal compared with what it cost him to shut down during the shortage. The only assurance he wanted was that the new works were adequate. His attitude was typical of all customers. Management was now popular because service was the thing desired.

A community can have adequate water service if it thinks and acts in the light of present-day conditions rather than of times when we drank from backyard wells.

A Familiar Story

Ten years later another drought had practically the same effect on three other systems with which the writer is familiar. Supplies proved to be inadequate during periods of low stream flow; service was drastically curtailed; emergency supplies of poor quality were brought in to the distress of consumers; business suffered and unemployment was the result. In each case the local management, because of shortage of revenues and lack of sound expert advice from outside, had failed to make provision for the future in developing supply facilities, had failed to study drought cycles or to plot trends of water usage. Each one followed the short-sighted policy of keeping service cheap rather than adequate. It is probable that business losses alone during the periods of curtailed service exceeded the capital cost of the new facilities which were later provided.

Public Water for Urban and Suburban Areas

The following applies only to public water supply agencies, either municipally or privately owned, rather than to industrial or commercial supplies developed to care exclusively for the owner of the supply system. The latter are engaged in a private business rather than a public service. From the standpoint of available water resources of a district they are important and their adequacy and efficiency are important to community business health but their function and their problems differ from those of the public agencies.

Just what is the function of a public water supply agency in urban and suburban areas? Subject to important "ifs" which will be mentioned, it is submitted for your thought that the function of such a public water supply agency is to provide water, where, when and as needed. That is a big order and there are few agencies that meet it. Even after all proper allowances for the essential qualifications which will be expressed as "ifs" there are many failures to perform the function.

Let us take up the elements of the expression of function one by one.

Adequate Service

To provide water—where needed. A water system fails to meet this standard if its service be restricted to the closely built heart of the community, if it fails to expand its distribution facilities into the spreading suburbs as need for service arises and as developers and customers are ready and able to pay the necessary costs. A system which does not provide service when needs exist at high elevations and which sticks to the lowlands fails in its function. A system which cannot offer service to a new industry in new territory fails in its function. However, there are the qualifying "ifs" to consider later.

To provide water—when needed. Service which is available at hours when customers cannot conveniently use it but unavailable at convenient times is deficient service. Service which is adequate in winter or on moist, cool days but which is strictly limited on hot, dry days in summer when home owners need it to preserve their shrubbery, trees and lawns which cost money, is service which is deficient. Service which must be curtailed in periods of drought because of depletion of sources of supply is not truly adequate service. Our function is to supply water when needed and it is needed in periods of light rainfall at least as much as in normal periods. However, let us not forget the "ifs".

To provide water—as needed. The water should be available not only when and where needed but its quality must meet proper standards. In one of the instances of failure of supply which have been referred to an emergency source was tapped, high in acid and in hardness. The water furnished was better than no water but its use imposed real hardships on the community. That system did not furnish water as needed. Water service which is available only as a slow trickle and not at pressures and in flows adequate to meet the needs of customers under modern conditions of living and of industry, is not adequate service.

The "Ifs"

A public water supply agency can fulfill its function as stated:

(1) *If* wasteful use be eliminated. With the growth of population and the rapidly expanding use of water in industry and irrigation, there is not enough water to allow our people to waste it. Use must be limited to need—even waste for which users might be willing to pay the cost may well have to be prevented. So in the statement of function the emphasis is on "need" as distinguished from "wasteful use".

(2) *If* commercial, industrial and irrigation uses be kept in realistic relation to practically available sources of supply. Where sources of supply, even if fully developed, are limited in quantity the public water supply agency should not be expected to offer service to new prospective big users of water which will cripple service to other customers. Local boosters should understand that not all communities can, in fairness to the public, take on enterprises requiring large quantities of water. A realistic balancing of potential demands against potential supplies is a necessity.

(3) *If* extensions of distribution system facilities be made under terms and conditions which do not require existing customers to subsidize the developers of outlying real estate. When new customers can be served only following additions to system which cost more than that on which the new revenue will yield a fair return the new customers are being subsidized by the older customers.

(4) *If* expert advice on financing, planning and operating the water works system be secured and retained. Unless the entire water works enterprise be guided by persons trained and skilled in the sciences and arts involved and unless these persons be dedicated to the rendering of adequate water service when, where and as needed, the community faces trouble, hardships and business loss. If such guidance be available and be followed adequate water service can be rendered.

(5) Finally—*If* the community be ready, willing and able to pay the cost of adequate service. Adequate service requires advance planning, development and constructon to take care of needs which will develop over the years. Adequate service involves provision for adverse conditions based on pessimistic appraisals of potentials. Such adequate service cannot be offered unless the community recognizes and acepts its cost—high in comparison with inadequate service or with the traditional cheap water which too many people cannot forget. A community can have adequate water service if it thinks and acts in the light of present-day conditions rather than of times when we drank from backyard wells.

Major Water Works Problems

The demand for water from public water works is growing tremendously. Increases in demands as measured by total annual pumpage range in the last ten years from twenty-five percent to upward of one hundred percent. Peak load demands have risen much more rapidly and these peak loads put real strains on a system. It has been necessary to increase investment in plant and property to care for these growths—increases of better than two hundred percent being quite common.

A major problem, then, is the physical one of finding adequate supplies in the face of mounting rival claims on total water resources. The second major problem is the securing of adequate funds to solve the physical problem. The third major problem is the securing and holding of the dedicated personnel required to plan, develop and operate an adequate system.

The final problem, and the one of which the solution would ease all the other problems, is the development of local community realization of the value and cost of a modern adequate public water supply.

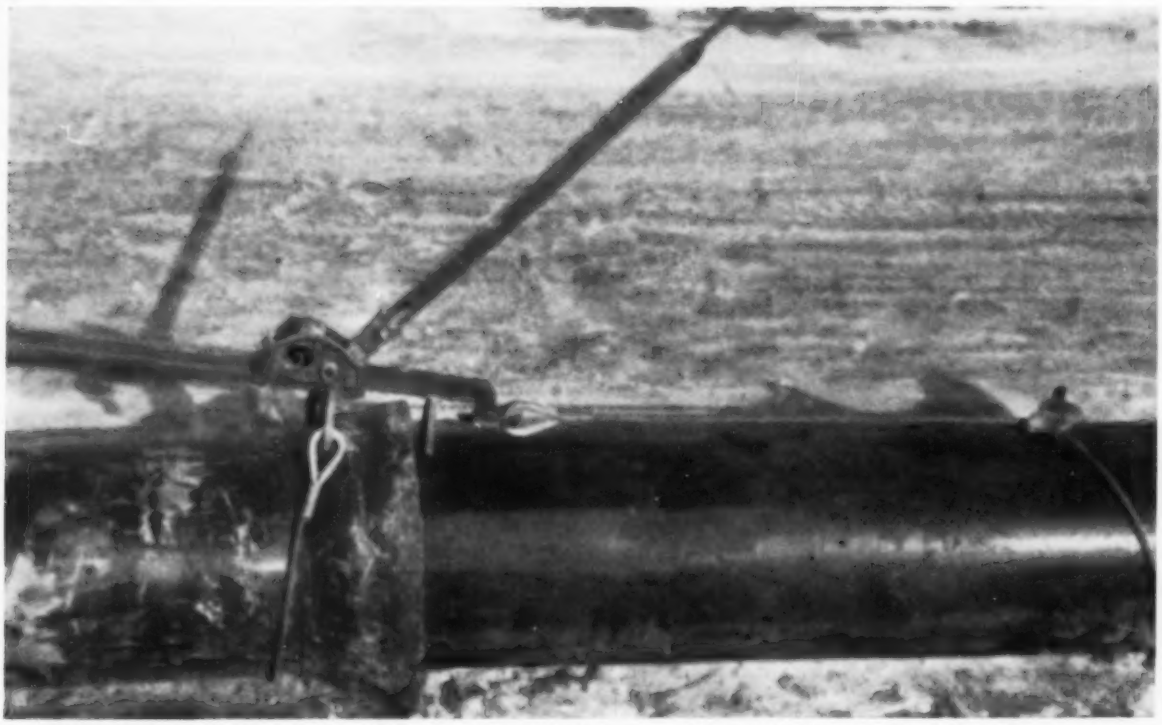
Air and Water Pollution Abatement Conference Proceedings Published

The Manufacturing Chemists' Association, Washington, D. C., has published complete proceedings of its 1957 Air and Water Pollution Abatement Conference.

The 131-page, illustrated book contains 14 papers dealing with pollution abatement. Subjects include dispersion determination, evaluation of air pollution statutory approaches, techniques for biochemical oxidation, assimilation of organic pollutants, developing company interest, multi-purpose incineration, sedimentation plant design, incineration of organic wastes, and others.

Authors of the papers are recognized leaders in the field. The MCA abatement conference, first of its kind since 1954, was held last April.

Bound copies of the book may be obtained from the Manufacturing Chemists Assn. for $2 each at 1625 Eye St., N.W., Washington 6, D. C.



MAKING UP a 12 inch cast iron pipe joint with a jack is one of the methods used for installing . . .

"Slip-on" Joint Pipe

EDITOR'S NOTE: Within the past few years, a new type of joint for cast iron mains was introduced to the water works industry. This joint, loosely termed, "slip-on," "slip-type," or "single-gasket," is being manufactured in four different styles by four different companies—"All-Tite" by Alabama Pipe Co., "Bell-Tite" by Clow Co., "Fastite" by American Cast Iron Pipe Co., and "Tyton" by U. S. Pipe & Fdry. Co.

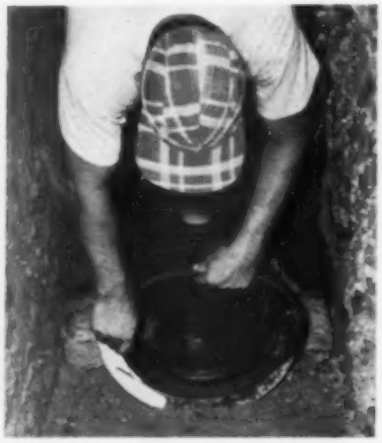
In the belief that experiences with this new type of joint would be of interest to readers of *Water & Sewage Works*, we asked Mr. Amsbary, a past president of AWWA, to prepare a summary of experiences in his company with this new type of joint. In order to broaden the experience, Mr. Amsbary called on three other superintendents in sister companies: Frank E. Dolson, Supt. of Distribution, St. Louis County Water Co.; L. J. Lukrofka, Supt. of Distribution, Missouri Water Co., Independence, Mo.; and Leo Louis, Vice Pres. and Gen. Mgr., Gary-Hobart Water Co., Gary, Ind.

This article, then, represents the experiences of four water works superintendents with respect to one brand of joint. The opinions expressed are those of the author or his colleagues, for which *Water & Sewage Works* assumes no responsibility.

by FRANK C. AMSBARY, Vice President and General Manager, Long Island Water Co., Lynbrook, L. I., N. Y.

■ IN AN INVESTIGATION made of the experience of four different utilities and from data from other sources on the installation of "Tyton" Pipe, it seems safe to say that this recently developed joint is the most significant advance so far made in cast iron pipe.

FIRST STEP is to place lubricant in the bell.



NEXT STEP is to insert the joint gasket.

Bell holes that are necessary with both bell and spigot and mechanical joint pipe are eliminated. Also in the case of bell and spigot pipe compared with the "Tyton" joint, the work force can be reduced by not less than two men and in addition the store's account is simplified by the reduced quantity of sulphur compound, or lead, and hemp or one of the hemp substitutes, with the resulting decrease in bookkeeping required and money tied up. In the case of mechanical joint pipe the inconvenience of follower rings and nuts and bolts is eliminated. When single-gasket joints are available in fittings and appurtenances, all other types of joints will become obsolete.

Long Island Water Corp.

Relative to the elimination of poured joints in the laying of "Tyton" joint it has been found at the Long Island Water Corp. that the presently manufactured AWWA ringtight 6 in. valve will slip over the spigot of the 6 in. "Tyton" pipe making a completely tight joint. In sizes over 6 in. the outside diameter of the pipe is too great to accommodate the ringtight joint of valves of comparable size.

The experience of the Long Island Water Corp. is too limited to furnish explicit data. This type of joint was only recently made available in that area. Enough experience has been had, however, that the contractor who installs all of the company's pipelines, while absorbing three pay increases in his pipe laying crews sees fit to continue to install extensions of less than 500 ft with no increase in cost per foot and extensions of 500 feet and over at a less cost per foot, which will more than offset the increase in cost of "Tyton" pipe over bell and spigot using sulphur compound. No difficulties of any nature have been experienced in the use of "Tyton" pipe at this plant. All sizes from 6 to 16 in. inclusive have been installed.

St. Louis County Water Co.

Frank E. Dolson, Supt. of Distribution, St. Louis County Water Co. reports that their use of "Tyton" pipe has been limited due to a labor situation. The labor union in effect refused to lay it. This problem has been worked out and due to their favorable experience, they expect to install "Tyton" pipe as standard practice.

The first job consisted of 3000 feet of 6-in. "Tyton" pipe in a new subdivision. Using the Company's standard procedure for installing 6-in. pipe, a standard crew consisting of six men installed 2200 feet of "Tyton" pipe in approximately six hours—.0163 manhours per foot. The crew worked only at installing the pipe. Other personnel, consisting of a trenching machine operator and a trenching machine helper, together with a trenching machine, excavated the trench ahead of the crew laying the pipe.

Upon completion of the 2200 feet, the end of the pipe was capped and blocked and the entire strip subjected to a hydrostatic test. Water pressure was built up to 500 lb per sq in. by the use of a supplementary hand-type force pump and held at this figure for approximately one hour. An inspection of all joints on the pipeline indicated that the "Tyton" type of joint was able to withstand the test pressure with no visible leakage. There were two or three joints on the pipeline—for tees and fire hydrants, etc.—which were poured with sulphur compound and these joints, under the test pressure, showed some weeping.

This pipe was installed along a typical subdivision street that meandered considerably. Consequently it was necessary in installing the pipe, to make joints where considerable deflection was involved. It was observed that the "Tyton" type of pipe can be jointed together in a curved ditch under deflection conditions approximating about half of the maximum deflection allowable. It was also observed that there was no leakage from joints which were under maximum deflection.

The work of installing this type of pipe is considerably less than that required to install standard bell and spigot pipe with a poured joint. Yarning is entirely eliminated and, of course, the melting pot and pouring job is likewise eliminated.

This limited experience with the pipe indicated that, after proper lubrication was applied to the rubber ring, one pipe could be jointed to another pipe merely by pushing on the bell of the forward pipe with a light spade or crowbar pry. It is understood that very little more effort is required to join 8-in. pipes together but that in the 12-in. size and over it may be necessary to use the equivalent of a ratchet type of hoist or come-along.

Mr. Dolson believes that this type of joint is the best that it is possible to use. It is also his opinion that there will be material savings in its installations in almost every case. There are other cost contributing factors that will result in a net saving to the company. Some of these are increased productivity which will, of course, de-

A CROWBAR is the only tool needed to push the pipe home on sizes through 8 inch.

crease all overhead and associated costs. Another plus will be that there should be a decrease in the maintenance expense of repairing joints on newly laid pipelines. Due to the flexibility of the pipe it is felt there will also be a decrease in the number of breaks on this type of pipe during the transition period between summer and winter ground temperatures.

Missouri Water Co.

L. J. Lukrofka, Supt. of Distribution at Independence, Missouri, has had considerable experience with the installation of "Tyton" pipe in sizes of 6 to 16 in. inclusive.

This company installed 13,500 feet of 12-in. "Tyton" pipe, which was the first of this size to be made, and this installation was a real success. It was found on this larger size pipe that the most important factor in installing this pipe is to treat each section as a pendulum and take advantage of the weight of the pipe and by moving the pipe through an arc of about ¼-in. it can be sent home without the use of jacks, come-alongs, etc. This does require the pipe crew to develop a keen sense of rythmic coordination in the movement of this pipe. Once this coordination is attained, it can effect a 50 per cent reduction in installation man-hours. Team work pays dividends.

Mr. Lukrofka has found in the use of "Tyton" pipe, real and definite advantage in his pipeline construction.

1. *Stores Expenses*—Reduced overheads and less time required as it is necessary to stock only pipe and gaskets as compared to pipe, joint compounds, pouring snakes, pouring gates, pots, ladles, protective gloves, eye shields, joint compound heating furnances, jute, etc.

Less chance of operations being delayed, at any time, due to shortage or outage of any of the many items above.

Simplified records keeping and accounting in the stores department.

2. *Personnel Requirements*—Reduced basic pipe crew from six to four men by eliminating the kettleman and (mudder) joint pourer. On small jobs they find it most efficient to use a three-man crew and the power winch truck. Minimum of instruction and training required even when using unskilled labor.

3. *Installation Features*—a) *Deflection of Joints*—Joints can be safely deflected the maximum permissible provided the barrel of the pipe is not in contact with the bell.

PUSHING 16-in. pipe home with Gradall bucket at Long Island Water Corp. —12-in. pipe is made up in the same manner.

Previously, in the use of sulphur compound joints, only minor deflections could be made, thus requiring use of many fittings or have many thin joints and future leaks.

b) *No Bell Holes*—It is not necessary to dig bell holes as required to install a pouring snake, or caulk a lead joint, or tighten bolts of a mechanical joint. This is a big saving factor.

c) *Minimum Re-checks Required*—Once the joint is put together and sent home there is nothing else to check, pick-up or remove. Mechanical joints must be re-checked or one joint in a big job is sure to leak because someone failed to tighten all bolts on that joint. No waiting for pouring gates to cool before removal.

d) *Minimum of Equipment on the Job*—Bucket of lubricant and crowbar are basic equipment required on the job, therefore, crews move right along and no concern for items lost or left behind.

e) *More Work Days*—Adverse weather, rain, mud, water, or other conditions that would have stopped a sulphur joint job have no effect on laying of "Tyton" pipe. It can be laid in almost any condition encountered thus gaining many more working days each year. This is highly important where rainy weather used to catch crews with a lot of ditch open, and sometimes it was days before they could get back into the job again.

f) *No Worry of Leaks*—This water utility has not had a single leak on a "Tyton" joint in over 70,000 feet laid to date. More freedom for foreman to cover entire job. Only thing he needs to know is that the joint is all the way home whereas constant checking is necessary on other type of joints.

g) *Lines in Service Immediately*—As soon as a valve is installed in a section of line, that section can be placed into service and the jetting of the ditch or chlorination of the main can begin at once. This saves a great deal of "go back" time on these jobs. They have a large number of short jobs from 50 to 200 feet. Now they are able to make one of these short extensions, install the pipe, fill the line, jet the ditch, sterilize the line and clean up the job in a few hours time.

h) *Backfilling and Cleanup*—They are able to backfill the ditch immediately and keep within 50 feet of the pipe laying crew. This allows the job to be cleaned up fast, thus eliminating the hazard of open ditches, the expense of placing and tending barricades and flares, and the necessity of paying premium rates to have the

RYTHMIC method, without use of jack, come-along, or crowbar, utilizes pendulum action of pipe suspended by cable from above.

ditch backfilled after the sulphur hardened and the pouring gates removed. Their public relations have had a tremendous upsurge because people are happy to see a job cleaned up so quickly.

Some Precautions

Mr. Lukrofka claims that in their experience there are no real known disadvantages in the practical installation of "Tyton" pipe, but does feel there are some precautions that must be carefully observed to assure optimum results. These precautions are:

a) *Gasket Groove in Bell*—This groove must be checked for any rocks or excess cement. Gasket will be difficult to seal if any of these are present.

b) *Blocking*—This really should be an advantage in that the pipe comes apart equally as easy as it goes together. This means that blocking must be provided for the full thrust that is to be developed on any bend, change of direction or end of line. They feel that they are getting better construction now because their crews have learned early that they cannot count on the joint to hold the pipe in place against pressure. Good construction methods demand blocking, however, regardless of the type of pipe joint used.

Gary-Hobart Water Corp.

Leo Louis, Vice Pres. & Gen. Mgr. at Gary, Ind., reports that during the past year they have laid over 100,000 feet of "Tyton" pipe ranging in size from 4 to 12 in. with sizes of 6 and 8 in. prevailing.

Their statistics for the year of 1957 are not complete and job conditions vary so that accurate comparison is impossible.

Mr. Louis says that at first one might think that "Tyton" joint would result in a big savings. Labor of installation is less, but when this is analyzed, labor representing only approximately 25-30 per cent of the total cost, a 10 per cent savings in labor reflects about 3 per cent in over-all costs. On short jobs, 300 feet and less, while the job goes in quicker and easier, there is probably not any savings as the same crew would have laid the same amount of mechanical joint pipe. On jobs more than 300 feet long, savings will definitely be made.

The greatest savings occur with extensions of 1000 feet or more. Here pipe can be installed as fast as the ditcher will work. With a five-man crew they have laid over 1000 feet a day compared with an average of 350-400 feet using mechanical joint pipe.

Compared with mechanical joint pipe a real savings is made in the lower cost of "Tyton" pipe. The "Tyton" joint bell is stronger than the mechanical joint and, therefore, damage is reduced. Also stores handling is easier because there are no nuts, bolts and follower rings to store.

In summary, when the 1957 statistics are compiled, it is believed the cost will be about the same as 1956. But it must be remembered that labor rates have increased and at least that increase has been offset by installing "Tyton" pipe. Also the cost of valves and fittings has gone up but the lesser cost of installing "Tyton" pipe has also absorbed that increase. All in all, in a period of rising labor and material costs, by use of "Tyton" pipe Gary has been able to hold their own, cost-wise.

General Conclusion

Man-hours expended per foot for the installation of 6-in. "Tyton" pipe at the plants reporting for this article and at numerous other locations range from a low of .012 to a high of around .02. Comparable low man-hour figures apply throughout the larger sizes. It is believed that no other type of joint can equal these figures.

Are Professional Societies Necessary?

At a recent sectional meeting of the American Institute of Chemical Engineers, F. J. Van Antwerpen, Secy., stated that in the 5,000 professional societies in the United States, there are 11 major activities more or less common to all that illustrate the necessity of a professional society to its members and profession.

In amplifying the A.I.Ch. E.'s functions in each of these activities Van Antwerpen stated:

1) Conventions and meetings—Four each year on the national level.

2) Publications—CEP, A.I.Ch.E. Journal, Symposium Series.

3) Government relations—ACE, EMC and National Research Foundation.

4) Publicity—Left to local sections.

5) Statistics—Some work done for trade assns. Occasional salary surveys made.

6) Legal services—Non offered.

7) Education — Accrediting engineering courses for ECPD, and has raised the minimum standards for chemical engineering training.

8) Public service—Participates in ECPD for pre-professional counseling, and in EJC for post-professional counseling.

9) Standards—Now working on chemical processing standards in the nuclear field as well as many other fields.

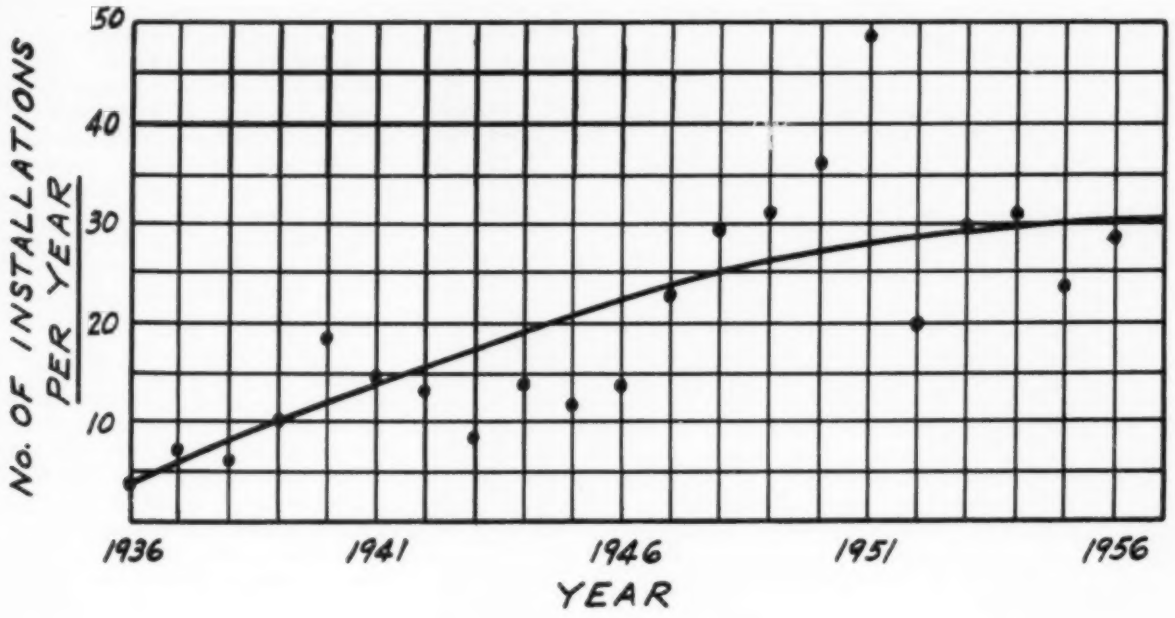
10) Advertising—None, except in cooperation with other societies.

11) Research—Collects about $80-90,000 per year from industry to sponsor research projects.

Walker & Lodge Form Partnership

Mr. George Walker and Mr. H. M. Lodge have announced the formation of the partnership of Walker & Lodge, with offices at 117 Liberty St., New York 6, N. Y.

The new firm will handle sales and service engineering in the areas of New York State, New York City and New Jersey for Simplex Valve & Meter Co., Orchem Pumps, Inc., and F. B. Leopold Co., Inc.



THE GROWTH of porous plate filter bottom installations since 1936 (Fig. 1)* is one indication that . . .

Porous Plate Filter Bottoms — *are now of age*

by FRANK C. ROE, Senior Engineer, Technical Service, Refractories Div., The Carborundum Co., Perth Amboy, N. J.

EDITOR'S NOTE: It is now a little more than 21 years since porous plate filter bottoms were introduced. During that time, much has been learned and arguments pro and con have come and gone. It seems, therefore, that a current, candid and complete report is warranted. When Mr. Roe was asked to write this article for *Water & Sewage Works*, his first comment was, "to one so closely associated with this idea, it seems like 'only a few short years ago' that porous plates were introduced and became practical. Like a son growing up, this infant has reached its majority before the impact is fully realized."

Although Mr. Roe has a proprietary interest in porous plates, there is probably no one who has a more thorough knowledge of the subject and in this article he has presented an objective report which delineates considerable detail on design, installation and materials, for the benefit of engineers in adapting porous plate filter bottoms to plant designs and specifications; also presented is information on "package" plant installations now available.

■ THE FIRST NORMAL sized porous plate installations in municipal filter plants were made in 1936 at Denver, Colo. and Grand Rapids, Mich. In the twenty-one years that have elapsed, more than 400 installations of Carborundum's "Aloxite" plates have been made all over the world under widely variable conditions.* (See Fig. 1)

* Installations of Carborundum "Aloxite" plates only; no record of competitive installations.

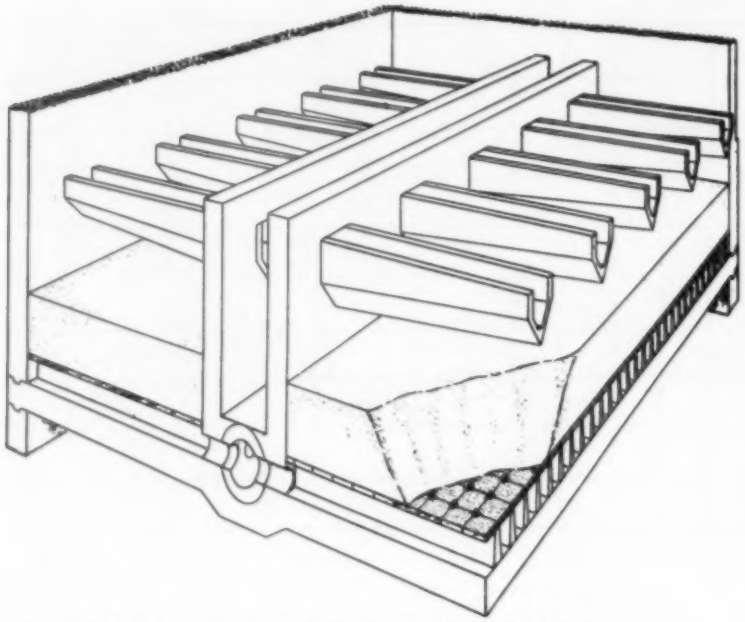


FIG. 2—Typical filter construction using porous plate underdrains.

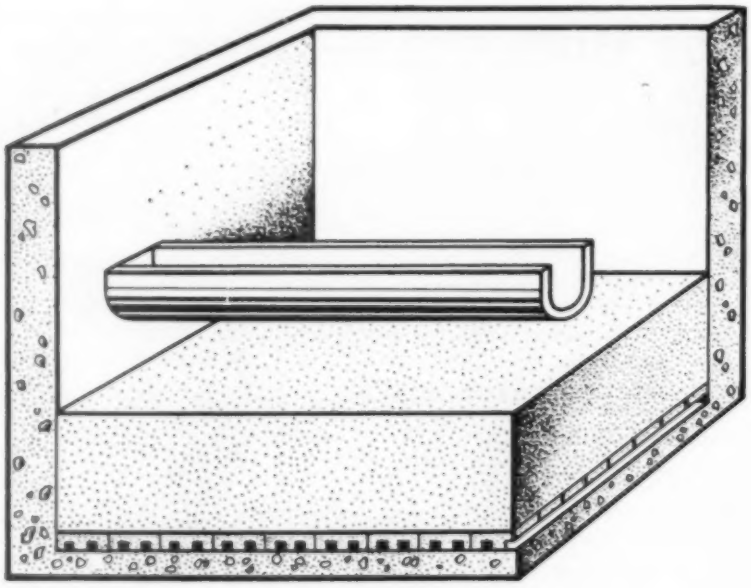


FIG. 3—Filter with channeled porous plate bottoms.

Unquestionably, the need for water treatment, including filtration, persists as one of man's expanding problems. It is just as certain that new methods of filtration will continue to develop and that as long as the rapid type back washed units are used, the perfect filter bottom will be like Utopia—never quite attainable.

By eliminating the graded gravel support for filter media, as typically illustrated in Fig. 2, the porous plate bottom comes close to an ideal structure, even though there are limitations in certain areas of use, as will be related later. Operation problems growing out of "air binding," non-uniform backwash, etc., that are inherent with any underdrain system that uses graded gravel, are eliminated by the use of porous plates and cost of filter maintenance is thereby reduced.

One example of maintenance cost that is of major consequence during the present period of ever increasing labor cost is the expense of removing, regrading and replacing an upset filter. Simultaneously, the value of the time that a filter is out of service for rebuilding, frequently can be a critical factor. Porous plates can eliminate these costs.

It was the potential benefit of elminating graded gravel filter media support as provided by porous plate filter bottoms, that originally appealed to engineers and continues to be the principal point of advantage. It was, in fact, the reason for the original developments more than a quarter century ago at Sacramento by Harry M. Jenks,[1] at Windsor, Ontario by Messrs. Gore, Nasmith and Storrie, at the University of Texas by Messrs. Jessen and Hinyard[2] and at Providence by Professor T. R. Camp,[3] all of which have been reported more or less completely. It is significant that subsequent reports in the literature,[4-10] which are all based on the currently used large pore ceramically bonded aluminum oxide porous plates, invariably stress the money saving benefits of completely eliminating graded gravel.

Initial Response

Because water supply engineering by its very nature must be sound and conservative, many designing engineers were hesitant to suggest the use of porous plate underdrains until "satisfactory performance is proved elsewhere" or until "all the bugs are worked out." There is nothing extraordinary about such a reactionary attitude. It is fortunate, however, in the interest of technical progress that there were a number of pioneers with the courage to put the new idea into use when probable advantage appeared to overshadow possible difficulties.

The pioneering paid off. As previously suggested, perfection was not attained nor was it expected. There was soon ample proof to skeptics, however, that porous filter bottoms could be used in most instances in a normal manner, permitting owners to reap the ultimate benefit of the idea.

Present Status

The extensive background of experience derived during the past twenty-one years could not be assembled in a precise or tabulated report form with data covering each and every condition of use. It is likely, as a matter of fact, that no two conditions of use out of the several hundred installations, are completely identical. At the same time, this report provides some interesting factual information concerning the basic experiences.

Within the past few months an independent survey organization submitted a questionnaire to all engineers in the United States who engage in water supply work. The reasonably good response (26 per cent) that was received, provides a consensus that is significant. These results from the survey are particularly cogent:

1. With a single exception, all consulting and designing engineers who have specified base or alternate use of porous plate underdrains, stated that they would continue to do so.
2. An overwhelming majority of engineers who responded stated that they now believed porous plate underdrains were acceptable with certain limitations, e.g., use in lime softening plants.
3. A considerable number of engineers replying to the questionnaire stated that more information on the porous underdrain and its performance, was desirable.
4. An extremely small number, all of whom had had *no experience* with porous plate underdrains, were negative or otherwise indicated that they would not consider such construction.

The recent survey strongly supports observations which the author has been able to make during the past twenty-one years of close association with the development and use of porous plate filter bottoms. These very candid observations are more specifically cataloged and enumerated as follows:

Application

1. Where the function of filtration is removal of flocculent solids from water that is pretreated and settled in a normal manner and is otherwise stable as to pH, satisfactory performance of porous plate underdrains will be experienced indefinitely and the full benefits derived from elimination of graded gravel filter media support.

FIG. 4—Concrete pier support for plain plates.

The only other qualification is that filtered water must be used for backwashing which, of course, is normal practice. The average diameter of pores in porous underdrain plates is more than twice the average diameter of interstice in 0.5 mm filter media, a fact that some engineers do not realize. Consequently, trace solids that penetrate filter media will invariably pass through underdrain plates.

2. Where the function of filtration is to remove precipitated calcium carbonate from lime softened water and the reaction has not been stabilized by recarbonation or other means prior to actual filtration, it may be unwise and/or uneconomical to use porous plate bottoms. Continued reaction through the filter units would most certainly result in incrustation of filter underdrains to a serious degree. Removal of such incrustation by acid treatment can be accomplished but if too frequent, it can be economically prohibitive.
3. Where the function of filtration is to remove precipitated iron or manganese hydroxide, it is equally impotrant to the success of porous plate underdrains to insure adequate pretreatment. Without thorough aeration followed by ample periods for coagulation and settling, precipitation of hydroxides will occur throughout the filter so that coating and ultimate clogging of pores in the underdrain system will develop.

As in the case of carbonate incrustation, iron and manganese hydroxide solids can be removed from porous plate underdrains by acid treatment. The practicability of such treatment has not been proved, however.

4. Where untreated waters are filtered, as in the case of recirculating swimming pool water, low turbidity surface supplies and the like, porous plates can be used with complete success. It is important, however, to select filter media of a size that will provide the desired water quality.

In installations of this character, it is normally desirable to use filtered water for back washing. Many such installations have given long and sat-

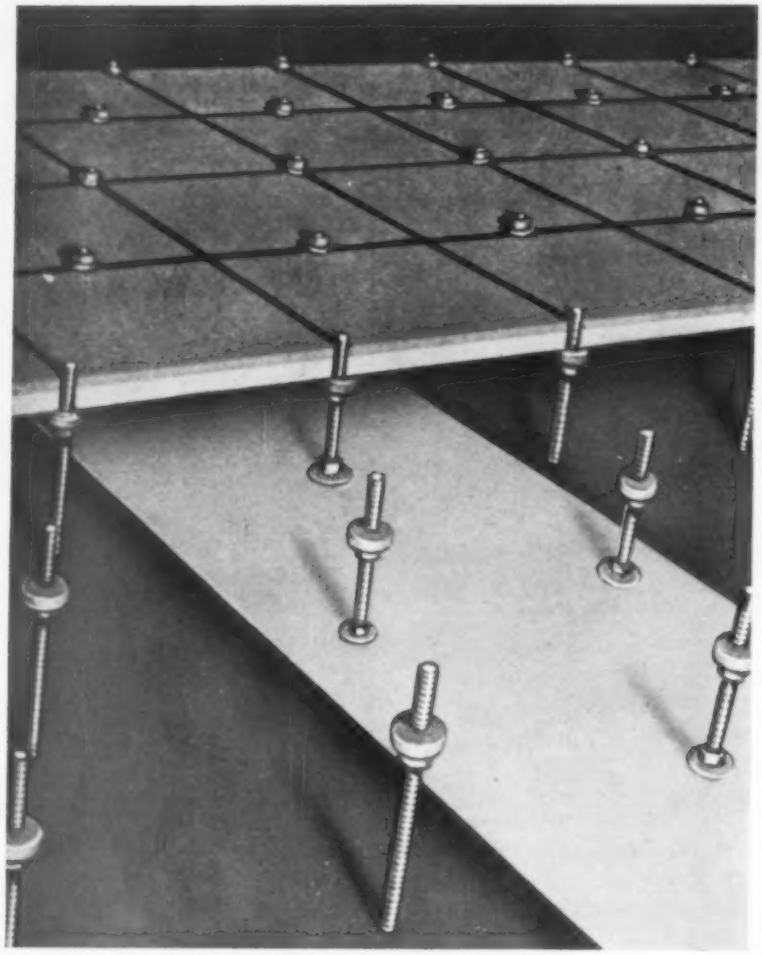


FIG. 5—Long bolt support for plain plates.

isfactory service without filtered water backwash, but the practice is not recommended and probably is prohibited by many State Health Department operating codes.

5. Where porous underdrains are used to support Zeolite in softeners of either gravity or downward flow pressure types, complete satisfaction is experienced. This extremely valuable benefit of positive protection against loss of expensive ion exchange media is obvious. Porous plates are unaffected by brine (or acid) used for regeneration. They should not be used however where strong caustic is used for cation regeneration, since caustic will attack the ceramic bond and cause ultimate structural failure.

Design

During these 21 years of experience, some interesting and important design and installation ideas have developed; some have proved sound, others have been discarded.

A. *Channeled Plates.* The original ceramic bonded porous underdrain plates with channels formed therein assembled (as shown in Fig. 3) to correspond to a system of laterals on the filter floor, was simply too costly. Also, filter size is limited by hydraulic considerations related to the area of the channels. Use of this idea is now confined to small units where there is an extremely limited operating head available.

Incidentally, it is essential to anchor such plates to the filter floor with bolts to insure stability. A permanent adhesive to bond plates to the floor is conceivable but none has been discovered.

B. *Pier Support—Plain Plates.* During the period of successful development reported herein, more installations have been made with plates bolted to concrete piers than any other single design. Fig. 4 illustrates the usual construction, although many variations exist due to different methods of introducing wash water.

C. *Long Bolt Support—Plain Plates.* Fig. 5 illustrates the initial 3-point long bolt support construction conceived by T. R. Camp, providing unobstructed space below plates for uniform wash water distribution. There are now a considerable number of plants in which this design has been utilized satisfactorily.

In recent years a predominant number of plants have been built with this simple long bolt support construction because it is lower in cost than any other design offered to date. Most of the designs have been based on bolts at corners only, rather than the 3-point principle which was found unnecessary in the interest of uniform support and anchorage. Support and anchorage at the 4-corners of plates is completely satisfactory because the joint sealing compound, also used between plates and bearing washers, prevents plate stress. The 4-point design is simpler in layout and construction. Furthermore, serious cantiliver stress of plate corners is avoided during construction due to the weight of workman standing on an unsupported corner.

A complete long bolt design filter bottom "package" is offered by Christy Firebrick Co., St. Louis, Mo. It comprises plates, stainless steel bolts, square washers and nuts and joint sealing compound along with adequate instructions for installation in several ways adapted to existing or new structures.

D. *Hardinge Co.—Automatic Back Wash.* This is a complete filter plant "package" that is both unique and outstanding in economic possibilities for many situations. A single filter unit actually is a complete self contained plant that will deliver a uniform supply of filtered water continuously.

This condition is achieved, as may be evident in Fig. 6, by a traveling wash compartment that segregates one small portion of the filter at a time for washing by a self contained pump while the balance of the unit continues to operate on the filter cycle in a normal manner. Porous plates, supported by a structural steel framework and with shallow steel compartments

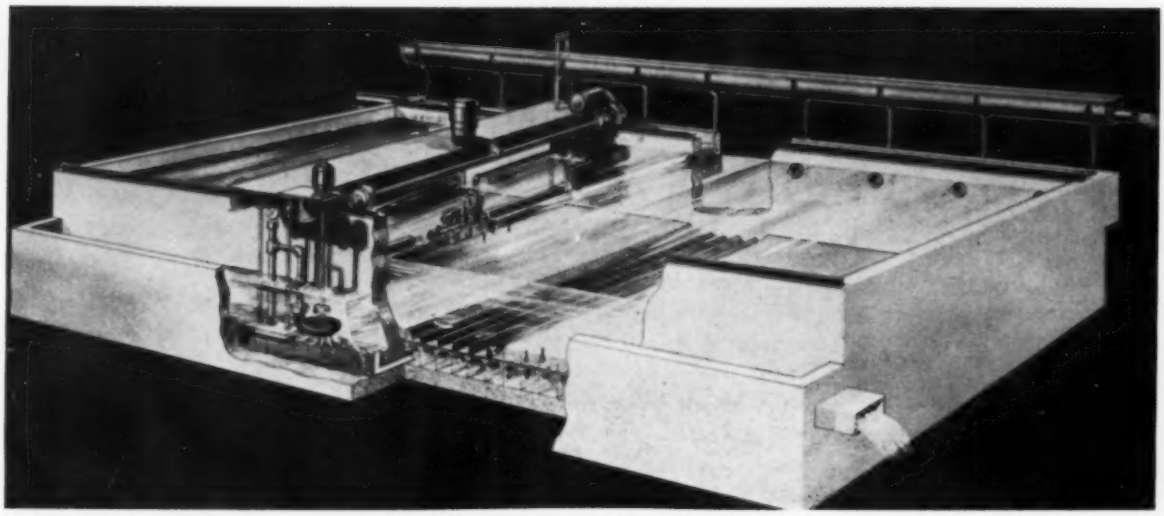


FIG. 6—Hardinge automatic back wash filter.

across the filter above, comprise the only practical type of underdrain system that can be used with such a design.

E. *Beam Support.* Structural steel beams (channels) set in one direction, with plates bolted thereto as illustrated by Fig. 7, is a construction frequently used for pressure filters. A majority of the pressure filter installations of porous underdrains incorporate this design principle.

Complete pressure filter units utilizing porous plate filter bottoms of this general design, are now available from Black, Sivalls and Bryson of Oklahoma City, Okla.

F. *Barstow Tile Support.* In 1950, E. D. Barstow of Akron, Ohio, conceived the use of a vitrified clay tile block design for porous plate underdrains and applied it to two or three plants in Ohio. Fig. 8 is a cross section of this tile block design with the porous plate underdrain installed therein.

This idea has merit because of low cost and the elimination of hold down bolts. It is not as flexible in adaptation to filter construction as some other designs since a central raised wash water box manifold is required, with wash gullet above.

Installation

The old adage about a "chain being no stronger than its weakest link" certainly applies to filter construction and designs based on the use of porous plates are no exception. Experience has shown the need to follow these steps carefully:

1. Check each plate for soundness when it is laid (they can be cracked in shipping and handling).
2. Make certain that every bolt is thoroughly anchored.

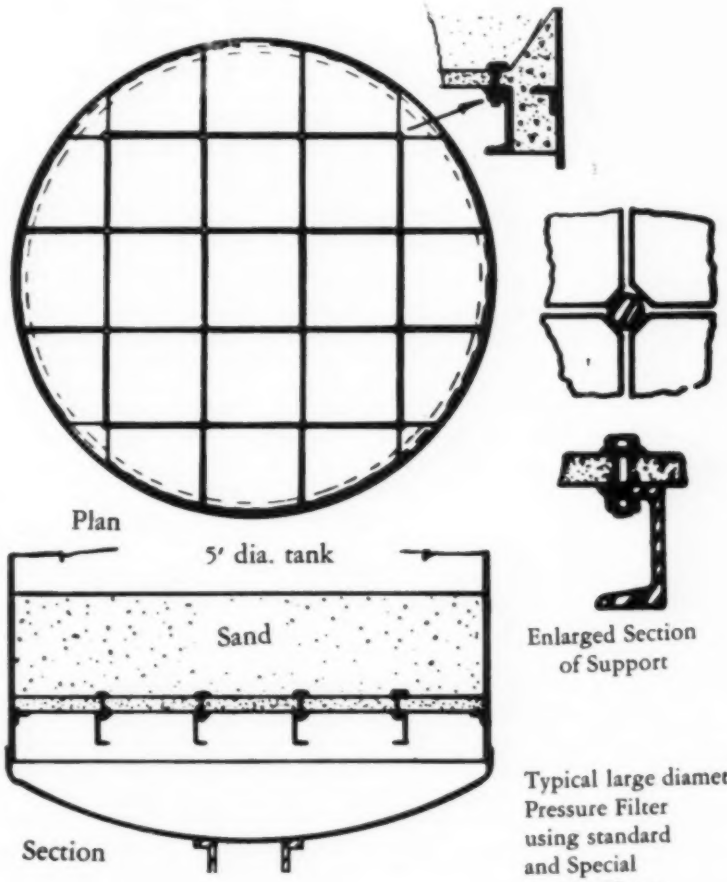


FIG. 7—Structural steel beams (channels) set in one direction with plates bolted thereto.

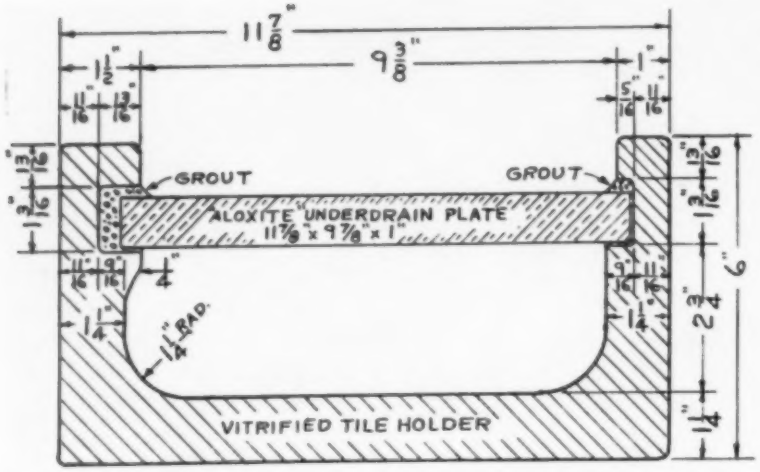


FIG. 8—Barstow vitrified clay tile block design for porous plate underdrain support.

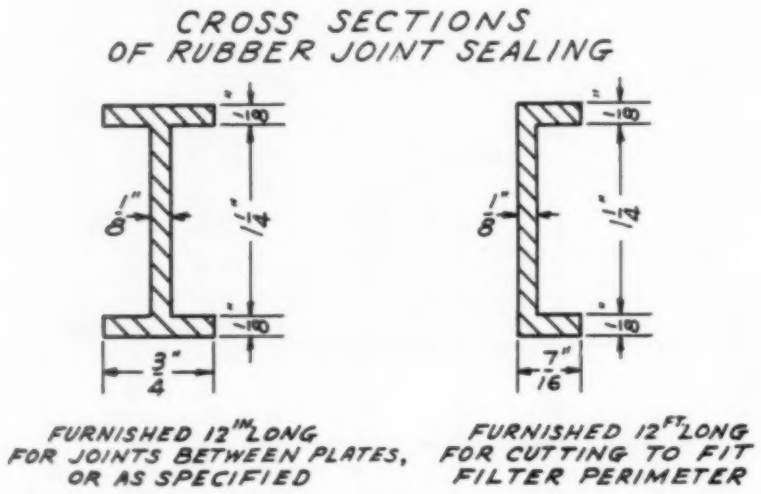


FIG. 9—Cross-section of rubber joint sealing.

3. Thoroughly clean and wash floor and area below plate elevation.
4. Be sure that all joints between plates are sealed.
5. Protect plates with covering during joint sealing, except for joint areas, against excess cement and foreign matter.
6. Tighten nuts over washers hand tight only, or to 5 lb with torque wrench, to avoid plate corner cracking.

It is apparent that none of these requisites is difficult or complicated to follow. In simple terms, installation technique can be summarized as "common sense" and "good workmanship." The reader may add an aside here that "such human attributes may not be easy to find in the modern labor market." The only answer to that is good supervision of installation.

Materials

1. *Plates.* Porous underdrain plates proper are composed of fused aluminum oxide granules and a ceramic bond. After plates are formed, they are kiln fired at approximately 2435°F. Such a material is, of course, permanently unaffected by water or any condition of oxidation. It is likewise resistant to commercial acids as may be used for cleaning filters. Porous plates are attacked by strong caustic but are not affected by a mild 5 per cent solution of sodium hydroxide as may also be used infrequently for cleaning of filters.
2. *Bolts.* With the thought of almost permanent balanced construction in mind, it usually is desirable to use stainless steel for hold down bolts. On the other hand, if the water is not aggressive, ordinary low cost galvanized bolts are quite satisfactory as is evidenced by extensive use of same during the past 21 years.
3. *Joints.* A wide variety of materials has been used for joint sealing between plates and as a means of providing uniform bearing on piers, etc. The two most extensively used materials are phenol free petroleum asphalt and Lumnite cement, mixed with fine sand. The coarse texture of plates insures a good bond with almost any cement that is thoroughly applied.

Quite recently some installations have been made with rubber gaskets. Cross sections of such gaskets for use between plates and between plates and filter wall, are illustrated by Fig. 9. They are obtainable from Oliver Tire and Rubber Co. of Oakland, Calif.

Cost

No report on an equipment or structural development is complete without some answer to the question, "how much?" Obviously, the unit cost factor for porous plate filter bottoms varies with design, location and filter area. Other factors, such as, whether a job is new or reconstructed, whether it is done by owners, workmen or by contractor, can have an important bearing on cost.

The price of porous plates alone at the end of 1957 averaged about $4.50 per sq ft delivered, as compared with a price of about $1.80 per sq ft in 1936, when they were introduced. Thus, cost of plates alone has inflated less than other commodities and less than the cost of installation.

A reasonable basis of estimating total installed cost has been to double the cost of plates and then add or subtract slightly to compensate for local conditions. On this basis, $9.00 per sq ft can be used as the starting point.

Incidentally, this cost estimate assumes false bottom construction with long bolts per Fig. 5 which was reported as lowest in cost at present. Inflated labor rates have increased the cost of other designs disproportionately.

One important point should be made

here if comparisons on installed filter cost alone are to be made with other filter designs. Porous plates eliminate graded gravel, hence; the cost of that item in place must be added to the installed cost of any other filter bottom to provide a realistic comparison.

Summary and Conclusion

In the interest of economy of engineering and construction plus localized responsibility, the modern trend to "package" designs for any unit of equipment seems logical. The lack of a complete unit, however, has handicapped progress in the use of porous plate filter bottoms during most of the 21 year period since these plates were introduced. Engineers have had to piece together plates and accessories with their own ideas of design and construction.

It is gratifying to report that definite progress has been made in recent years to overcome this handicap. At least three companies are offering complete filters equipped with porous plate filter bottoms and one company offers a unit adapted to any filter design.

This report on experiences has included some detail on design, installation and materials in order to simplify the task of engineers in adapting porous plate filter bottoms to plant designs and specifications. The same information should help additional filter equipment manufacturers and/or contractors to establish and offer so-called "package" filter bottom units.

It is entirely reasonable to conclude on the basis of the points of achievement discussed herein, developed over 21 years of robust growth, that porous plate filter bottoms are now established as functionally sound where properly applied, and economically beneficial.

BIBLIOGRAPHY

1. Harry N. Jenks. "A Cemented Gravel Slab." *Jour. AWWA*, 16:542 (November, 1926).
2. F. W. Jessen and H. N. Hinyard, "Porous Plate Filter Bottom." Thesis, University of Texas (1927).
3. Thomas R. Camp. "Experimental Study of Porous Plates for Use in Filter Bottoms." *Jour. New Eng. Wat. Wks. Assn.*, 49:1 (March, 1935).
4. O. J. Ripple. "Experience with Porous Plates for Filter Underdrain at Denver, Colo. *Wat. & Sew. Wks.* (Mar., 1937).
5. Henry T. Hotchkiss, Jr. "Porous Plate Filter Bottom." *Wat. & Sew. Wks.* (Nov., 1939).
6. Loran Stevens. "Porous Filter Bottoms at Flat Rock, Mich." *Journal AWWA*, 32:494.
7. A. H. Ullrich. "Rapid Sand Filter Design and Maintenance." *Wat. & Sew. Wks.* (Oct., 1949)
8. Frank C. Roe. "The Porous Plate Filter Underdrain System." *Jour. Maine Wat. Util. Assn.* (January, 1950).
9. Winston H. Berkeley. "Experience with Filter Underdrains at Lewiston, Idaho." *Jour. AWWA*, 44:491 (June, 1952).
10. Norman E. Jackson. "Study of High-Rate Filtration at the Dalecarlia Plant, Washington." *Jour. AWWA*, 47:129 (February, 1955).

Fresh Water from the Sea for Bermuda and Virgin Islands

The first plants utilizing a new thermal compression process for evaporating fresh water from salt, developed by the Max Silencer Co., will go into operation this winter at the Castle Harbour Hotel, Tucker's Town, Bermuda, and the 600-acre Caneel Bay Plantation hotel in St. John.

Each unit is capable of distilling 16,000 gallons daily of highest purity water, eliminating the need for complete reliance on uncertain rainfall and water imports costing up to $20 per 1,000 gals. The plants are expected to pay for themselves through savings within three years.

The new thermal compression system uses steam generated in an oil-fired boiler as opposed to the vapor compression method which uses a compressor. The reduction in the number of moving parts makes for quiet operation, greater economy, and simplified maintenance. The Maxim unit is a self-contained "package", directly connecting the ocean and the fresh water system and can be operated by regular maintenance personnel.

Auxiliary use of the evaporator for heating swimming pool water in winter and all domestic hot water service cuts the expense of distilling fresh water to less than one dollar per thousand gallons.

Interstate Project to Study Algae and Short Filter Runs

There currently is being developed an interstate project to study the common problem experienced seasonally at water treatment plants utilizing Lake Michigan water which problem is one of poor sedimentation and short filter runs, primarily due to the presence of nuisance organisms (algae) and other adverse water quality factors.

The project is being sponsored by the West Shore Water Producers Association with cooperating agencies, including the State Health Departments of Wisconsin, Illinois, Indiana and Michigan; the U. S. Public Health Service; and the Great Lakes Research Institute of the University of Michigan for the Collection of Meteorological and Hydrological Information. Professor M. Gamet of Northwestern University is Chairman of the committee in charge of the study.

The objectives of the project are: (1) Determine the economic and other adverse effects of short filter runs due to nuisance organisms, (2) Identify the water quality conditions which contribute to the aforementioned problem, (3) Evaluate methods used by the plants to cope with these treatment problems, (4) Determine improved treatment methods for Lake Michigan Water under these adverse conditions to provide a more economical operating cycle.

Briefly, the study will be done on 10 water plants to be selected at a later date from a total of 17 plants under consideration. The plants are to be selected on the basis of geographical location, size, type facilities, and personnel. It is to be carried out for a period of one year, starting Jan. 1, 1958. Of the 17 plants being considered, four are in Michigan and include Benton Harbor, Grand Rapids, Holland and Muskegon.

Recognizing that a study of this type requires uniformity and standardization of methods, techniques and procedures so that the results may be evaluated and compared between plants, a special effort is being made to establish uniformity by operator training, routine monthly field inspections of all plants, and the submission of duplicate check samples to one central laboratory.

> Nearly every great discovery in science has come as the result of providing a new question rather than a new answer.
> —*Paul Meglitsch*

At the annual meeting of the Board of Directors of the AMERICAN WATER WORKS ASSN., the business transacted included the selection of . . .

AWWA Officers, Honors, and Awards for 1958, *and important policy decisions*

■ OFFICERS OF THE AWWA are nominated by a committee before the anual board meeting each year and in the event no further nominations are received before March 1, those nominees are considered to be elected to office. This year, the elected officers are:

President: **Lewis S. Finch,** Vice President and Chief Engineer, Indianapolis Water Co., Indianapolis, Ind.

Vice President: **Lauren W. Grayson,** General Manager and Chief Engineer, Public Service Department, Glendale, Calif.

Treasurer: **William J. Orchard,** Director, Wallace & Tiernan, Inc., Belleville, N. J.

Board action included the election of four men to HONORARY MEMBERSHIP:

Morrison B. Cunningham, Director of Public Works, Oklahoma City, Okla. Member of the Association since 1930; President 1954; Director for Southwest Section 1948-51; Fuller Award 1949. A devoted servant of the people of his city; an example of the pioneer spirit of his state; and above all a loyal citizen of his country.

Victor M. Ehlers, Director, Division of Sanitary Engineering; Texas State Department of Health. Member of the Association since 1927. Fuller Award 1941.—"One who has devoted his life to the health and welfare of the people of his great state; and a believer in the value of voluntary organization to promote worthy public enterprises."

Fred G. Gordon, Assistant Chief Engineer, Bureau of Engineering, Department of Public Works, Chicago, Ill. Member of the Association since 1921; Life Member 1952, Director, Illinois Section 1951-54; Diven Medal 1956.—"An engineer thoroughly grounded in the criteria of his profession; one who possesses the ability to evaluate those elements essential to the development of reliable facilities for water supply installations."

Louis F. Warrick, Sanitary Engineer Director, Chief, Technical Services Branch, Public Health Service, Washington, D. C. Member of the Association since 1920; Life Member 1950; Fuller Award 1940.—"Long a leader in Sanitary Engineering; a constructive thinker and advocate of progress in the field of environmental sanitation. One who inspires his associates to worthwhile action."

Ray L. Derby was awarded the DIVEN MEDAL for his noteworthy work in the field of control of water quality through the many phases of purification and treatment, and for his efficient leadership in the preparation of the 10th Edition of Standard Methods for the Examination of Water, Sewage and Industrial Wastes. The Diven Medal award is made to the member who has rendered the most outstanding service to the Association during the year.

H. O. Hartung was awarded the 1957 GOODELL PRIZE for his paper "Calcium Carbonate Stabilization of Lime Softened Water" as published in the December 1956 issue of the Journal. Mr. Hartung's paper records an intensive and careful study of certain new aspects of stabilization of water which, as time passes, will contribute to the general improvement of the quality of water delivered to the users of municipal supplies. The Goodell Prize is awarded annually to the member of the Association who has made the most notable contribution to the science of practice of water works development, as recorded in the form of a paper published in the Association's Journal.

Division Awards

These Division Awards are made annually, one for each of the Association's four Divisions, for the paper considered by the Award Committee of each Division to be the best paper published in the Journal in its field of interest during the year. The awards for 1957 are:

Jerome B. Wolff, the Distribution Division Award, for his paper entitled "Forecasting Residential Water Requirements for Distribution Systems." This paper, published in the March 1957 issue of the Journal very competently appraises the impact of rapid population growth in American cities and strongly advocates an annual reexamination of the ability of the water systems to meet the impending customer demands. Mr. Wolff is a Cons. Civil Engineer in Baltimore, Md.

H. H. Gerstein, the Management Division Award, for his paper entitled "Impact of Water Use for Air Conditioning on Chicago's Water System." This paper was published in the June 1957 issue of the Journal. A dramatic account of the heavy burden placed upon the pumping and distribution facilities of the Chicago system emphasizing the critical need for stronger regulation and conservation of water use. Mr. Gerstein is Asst. Chief Water Eng., Dept. of Water & Sewers, Chicago, Ill.

Graham Walton, the Purification Division Award, for his paper entitled "Relation of Treatment Methods to Limits for Coliform Organisms in Raw Waters." This paper, published in the October 1956 issue of the Journal clearly appraises the values to be derived from improvements in water treatment methods and points the way to greater water supply. Mr. Walton is Sr. Sanitary Engineer, Robert A. Taft San. Eng. Center, Cincinnati, Ohio.

H. O. Banks, the Resources Division Award, for the paper entitled "Sea Water Intrusion in California." This paper published in the January 1957 issue of the Journal records the information developed from field studies made by the authors and ground water development along the coast lines. (In the preparation of this paper, Mr. Banks had the collaboration of Messrs. R. C. Richter and James Harder.) Mr. Banks is Director, State Dept. of Water Resources, Sacramento, Calif.

James D. Goff, the Harry E. Jordan Scholarship, by unanimous decision of the Committee. Mr. Goff expects to be graduated from Southern Methodist University next June with a B.S. degree in Civil Engineering. As part of his undergraduate work he has been conducting a study of head losses through the Dallas water plant. Due to his present connections in Dallas, he proposes to carry on his advanced work at SMU.

Section Awards

HILL CUP: Awarded for membership growth during the year, the Hill Cup for 1957 was awarded to the IOWA SECTION which had a point score of 30.264. The Rocky Mountain Section was second with a point score of 27.497; and the New Jersey Section third with a point score of 18.585.

HENSHAW CUP: Awarded to the Section which has the greatest percentage of its members present at the Section meeting. The Henshaw Cup for the year 1957 was awarded to the PACIFIC NORTHWEST SECTION which had 70.6 per cent of its members in attendance at its annual meeting. The Rocky Mountain Section was second with 64.1 per cent of its members present; and the Arizona Section third with 59.5 per cent of its members present.

Recommendation re Certification Policy of AWWA

1—AWWA should continuously increase the scope of, improve and modify its standards.

2—AWWA should so amend its standards as to require the supplier upon request of the purchaser of goods under these standards, to furnish a sworn certificate of full compliance with such standards.

3—AWWA recommends to its members that this certificate of compliance should always be requested if applicable. AWWA purchasers should be encouraged always to purchase "Per AWWA Standards" where available.

4—There has been discussion of certification of manufacturers. Some manufacturers may request certification. With that possibility in view it is recommended that the Secretary should take prompt steps to register a "mark" signifying "made according to AWWA Standard."

5—That this Board, after affirmation by the Water Works Practice Committee, will enumerate those AWWA standards for which the mark will apply.

6—Upon receipt from manufacturers of a statement of willingness to furnish customers with certificates of compliance with such standards, AWWA upon request will issue a license to use the mark.

7—AWWA members should understand that the success of the certification program depends upon the members themselves.

8—Continuing permission to use the mark will depend upon the demonstrated good faith of the supplier.

OLD OAKEN BUCKET: This award, given annually to the Section having the greatest number of members, is again awarded to the CALIFORNIA SECTION which continues the lead, with 1,424 members at the end of 1957. The Southwest Section again stands second with 1,031 and the New York section again third with 866 members. The Old Oaken Bucket was put into competition in 1939. It has been won by the California Section continuously since that time.

During the Board meeting, several policy decisions of great importance were made. Approval was given to the initiation of an extended Public Information Program. The administrative staff was directed to put the Certification Program into motion. A statement concerning Public Entry Into Water Supply Reservoirs and Lands was approved. Support of the campaign to obtain adequate reimbursement for utility changes required by Highway Authorities was reaffirmed. Finally, the Secretary was directed to send to the members of the Senate and the House a copy of the Association's official statement on National Water Policy, together with the address presented by Dr. Abel Wolman at the Atlantic City Convention. Both were published in the July 1957 issue of the Journal.

Public Information Program

A special committee headed by President Fred Merryfield with John Murdoch as a Consultant presented to the Board a policy statement which the Board approved unanimously. Portions of that report follow:

(1) "A Public Information operation should be instituted at once and carried forward with vigor; (2) The public, community officials, and water works personnel must be better informed on the importance of water works in community life, of the need for improvements in water service; (3) AWWA owes a duty to the public and to its members to lead toward improved water service and toward improved training for water works managers."

The Committee expressed the belief that an informed public is a priceless asset of a community water works and that such an informed public will want improved water service, through water works systems, self sustained, and adequate to meet the growing needs of each community.

Committee recommendations were that (1) "Operation Water Works Advancement" be authorized with directions that it be actively promoted beginning at once; (2) close liaison be maintained by the Committee with the WSWMA, particularly concerning national advertising by its members; (3) in order to develop the AWWA Public Information Operation, a qualified man be appointed as Field Representative, one who should be capable of developing and should develop management seminars in various sections and regions through the National Office and Section Officers, possibly with different approaches in different areas, and the seminars should not be considered a part of Section meetings.

It was also recommended that the Field Representative should meet with members or groups of members in various areas to thrash out specific management problems — carry the message of good management to small but interested groups, aid in developing speakers' bureaus, aid in publicity development, speak at and aid in developing progress for section meetings on management, aid in developing seminars for the smaller cities through nuclei of good managers, aid in developing new material for public information.

It is hoped that by mid-1958, the selection of the Field Representative will have been made; meanwhile Mr. Murdoch as Consultant, will continue to act in that capacity.

As part of the program, the Board authorized the Association's staff to increase budget expenditures for issues of "Willing Water" to increase its value to the membership.

Certification Program

At the January 28th meeting, the AWWA Board reaffirmed the Board's recommendation re: Certification Policy of AWWA. That statement appears in a box in this report.

The Board emphasized that the certification policy *does not* mean that AWWA will certify products. It simply has set up a method by which manufacturers *may* certify that they conform to AWWA Standards and evidence that conformance by displaying the licensed certification mark on their products.

Section 1 of the Board's Resolution is in process in the revision of several Standards of the AWWA. The recommended form of affidavit for the manufacturer to use has been issued. Section 3 of the policy statement depends upon the cooperation and action of the members of the Association. The Board specifically directed the Secretary take the steps necessary to register a certification mark and develop the action outlined in paragraphs 5 and 6 of the resolution, so that the procedure can become fully effective with a minimum of delay. For the present, it does not appear desirable to attempt to issue certification licenses for standardized products, except water works valves and water works hydrants. In due time that certification procedure will be extended to a wider area of products.

Recreational Use of Reservoirs

A special committee of the Board headed by Wendell R. LaDue, developed a statement on the subject of the Recreational Use of Domestic Water Supply Reservoirs. The recommendation of the committee was adopted as the policy statement of the AWWA on that matter. The principal parts of that statement are shown in an accompanying box in this report.

Reimbursement of Utilities

From the Secretary's report to the members on Board action come these paragraphs.

"The Board reaffirmed its position of several years standing concerning the propriety of reimbursement of utilities for changes made by them at the direction of Highway Commissions. When the basic Highway Act was amended and re-enacted in 1956, the legislation included a section authorizing the use of Federal funds to reimburse utilities for such changes. Such reimbursement was to be in accordance with the laws of the state where the work was being carried on. Several of the states prior to 1957 had such legislation already enacted. Fourteen others enacted such legislation in 1957. Governors of six states vetoed the bills permitting such reimbursement."

"At the opening of the present session of Congress, hearings were initiated on highway matters by sub-committees of the Senate and House Committee on Public Works. There came into the open the fact that efforts were going to be made at Federal and State levels to over-turn the 1956 legislation so that utilities would not be reim-

Abstract of Policy Statement Regarding Recreational Use of Domestic Water Supply Reservoir

The factors involved in the protection of water supplies are so varied as to locality, size, and facility that a definite policy attendant to the ownership and control of reservoirs and their marginal areas has not been established by practice. The establishment of a specific overall policy is impracticable. Further, the water works executive must necessarily consider the implications of the varying attitudes of the public toward the utility's properties. This variation is wide when applied to privately-owned and publicly-owned properties. However, he must always bear in mind his primary responsibility to supply a safe and palatable water, Moreover, the location, purpose, and utility of reservoirs must be considered in reaching decisions concerning recreational uses. Reservoirs may be:

Equalizing Reservoirs—Reservoirs within the area served and delivering finished water ready for consumption to the distribution system.

Terminal Reservoirs—Areas providing end storage of water prior to treatment.

Up-Stream Reservoirs—Reservoirs providing storage of untreated water at various points in the watershed to provide or supplement the supply at the terminal.

It is considered generally that recreational use of "Equalizing" and "Terminal Reservoirs" and the adjacent marginal lands is inimical to the basic function of furnishing a safe and potable water supply to the system's customers, and should be prohibited.

Impounded or stored water in "Up-Stream Reservoirs" can be classed in three categories:

Class A—Water derived from an uninhabited or sparsely inhabited area, at or near the point of rainfall or snow melt collected in a storage reservoir, clean and clear enough to be distributed to the consumers with disinfection only.

POLICY—Safe practice in the water works field recognizes the necessity of permitting no recreational activity on the water and watershed lands in and about such storage reservoirs.

Class B—Water impounded from an area not heavily inhabited and allowed to flow from storage in a natural stream to the point of withdrawal and requiring treatment in varying degree in addition to disinfection.

POLICY—Limited recreational activities on such reservoirs and adjacent lands are considered permissible under appropriate sanitary regulations.

Class C—Water which has flowed in a natural stream before storage for a consideration distance, having received polluting materials from municipalities, industries, and/or agricultural areas; confined in a reservoir primarily for purposes of storage until such time as low stream flow makes the stored water necessary for the use of the downstream city; later allowed to flow from the reservoir to the tributary water works in an open stream accessible to the public; and requiring complete treatment.

POLICY—Recreation is considered permissible under appropriate sanitary regulations. The determination of the kind and extent of recreational use shall be the sole responsibility of the water works executive of the system involved whose primary obligation it is to provide a safe and potable water, and subject only to existing police powers.

The American Water Works Association registers its opposition to legislation permitting or requiring the opening of domestic water supply reservoirs and adjacent lands to recreational use. Control of water supply reservoirs must remain the prerogative of the water purveyor.

bursed for the changes required by highway construction. The most astonishing attitude expressed was that of Secretary Weeks who appeared before the Senate Committee on Public Works under Senator Gore's direction, with the statement that he personally opposed the use of Federal funds to reimburse utilities for the changes required by highway reconstruction."

"This whole campaign, which is spearheaded by the American Automobile Association and so-called Highway Users Conference (made up of automobile manufacturers, petroleum industries group, truckers association and the rubber goods manufacturers association), gives promise to impose upon utilities a tremendous cost for reconstruction of a nature which benefits no user of the utility service. The benefit accrues to the automobile users and truckers who are not concerned with the effect upon the user of utility service, water, telephone, electric power, light, gas, etc.

"The National Association of Railroad and Utilities Commissioners sees the ethic of this situation more clearly than many other governmental agencies and points out quite frankly that the imposition of these costs upon the utilities impose a burden upon the utilities and their rate payers which is unjust and which unduly burdens the utility—whether it be privately owned or publicly owned—in requiring construction to be made which is of no benefit of the utility service."

"In 1956 this Association organized a group of state-by-state representatives to combat the utility highway charges through action with the state legislatures. These groups will be called into action again in the winter of 1957/58 since the issues are joined again by aggressive action of those people who close their eyes to the facts of the situation and advocate no reimbursement whatever to the utilities who are adversely affected."

Other Board Actions

Other matters considered by the Board and approved:

(a) Organization of an Intermountain Section to be composed of members in the state of Utah, Southern Idaho and Eastern Nevada;

(b) Authorization for the use of Section funds for seminars in the field of management and/or special engineering at times and places separate from the regular meetings of the Section;

(c) Authorization of the affiliation of AWWA with the Chamber of Commerce of the United States;

(d) Reaffirmation of the selection of 1959, 1960 and 1961 Conventions as follows:

1959—San Francisco—July 12-17
1960—Bal Harbour
Miami Beach—May 15-20
1961—Detroit, Mich.—June 4-9

For the 78th Annual Convention, scheduled for Dallas, Texas, April 21-24, here is the tentative . . .

AWWA TECHNICAL PROGRAM

The following program lists the technical sessions for the AWWA Dallas Meeting. According to Harry E. Jordan, AWWA Secretary, some minor changes may be made in these listings.

Monday, April 21, A.M.

(1) General Session
Motion Picture—"A Hidden World"
Presidential Address—"Modern Techniques in Water Works Engineering"—Fred Merryfield
AWWA's Public Information Program—John H. Murdoch, Jr.
AWWA Policy—Recreational Use of Water Storage Reservoirs—Wendell R. LaDue
AWWA Standards—Shall They Be Enforced?—Louis R. Howson

Monday, April 21, P.M.

(2) Water Resources Division
Motion Picture—"Lifeblood of the Land"
Research in Evaporation Reduction—Uel Stephens
Operation of the Arkansas—White—Red River Basin—John A. Short
Water Quality Studies in the Arkansas/Red River Basin—Kieth S. Krause
Discussion—D. F. Metzler
Water Works Experiences With the Missouri River Basin Control System—M. P. Hatcher
Discussion—Jos. K. Neel, J. J. Erdei, H. O. Hartung
The Impact of Recreation on the Lower Colorado River—Robert K. Coote

Monday, April 21, P.M.

(3) Water Works Administration Committee
Open Session

Tuesday, April 22, A.M.

(4) Joint Session—Water Resources and Water Works Management Divisions
Motion Picture—"Water From Plans to Plenty"
Ontario's Water Resources Law—A. E. Berry
Regional Water Supplies, Financing and Cost Allocation—Richard Hazen
Watershed Development Plans for the Sabine River—John W. Simmons
Texas Water Problems—Marvin C. Nichols, Thos. Carr Forrest, Jr.

Tuesday, April 22, A.M.

(5) Water Distribution Division
Motion Picture—"Corralling the Colorado"
The Value of Cathodic Protection—George B. McComb
A New Stray Current Problem—Hugh L. Hamilton
Fifteen Years Operating Experience With the Colorado River Aqueduct—Robert B. Diemer
Plastic Coating/Lining For Steel Pipe—G. E. Burnett, C. E. Selander

Tuesday, April 22, P.M.

(6) Water Purification Division
Panel Discussion—Value/Limitations of Chlorine Residuals in Distribution Systems—H. A. Faber, Moderator; John R. Baylis, M. P. Crabill, A. E. Griffin, E. J. Umbenhauer
Panel Discussion — Stream Water Quality Monitoring—H. O. Hartung, Moderator; Edward J. Cleary, Ralph C. Palange, Lee Streicher
Water Treatment Problems During Low Stream Flow—PART I—D. F. Metzler
Co-authors—Russell L. Culp, Howard A. Stoltenberg
PART II—Richard L. Woodward
Co-authors—S. L. Chang, H. K. Clark, F. M. Middleton, C. M. Palmer, Graham Walton
Discussion—C. H. Connell

Tuesday, April 22, P.M.

(7) Joint Session—Water Works Management and Water Distribution Divisions
Motion Picture—"Operation Noah"
Making Street Construction Acceptable to the Public—Burton S. Grant
The Part Played by Water in Modern Fire Control—M. M. Braidech
Problems in Locating Elevated Tanks—Clyde E. Williams
Alternate Sources of Power for Water Works Pumping Stations—Edward Farmer
Emergency Organization to Control Water Main Breaks—Paul Weir, Sam Baxter, F. E. Dolson, H. W. Neimeyer

Wednesday, April 23, A.M.

(8) Water Purification Division
Motion Picture—"Mountain Water"
Effect of Synthetic Detergents Upon Water Softening Economics—W. W. Aultman, T. E. Larson
Chemistry of Chlorine Dioxide—M. L. Granstrom
Electrophoretic Studies of Water Coagulations—Janet B. Pilipovich, A. P. Black, A. M. Buswell, F. A. Eidsness
Use of Hydraulically Backwashed Screens For Surface Water—Ernest W. Whitlock, Robert D. Mitchell

Wednesday, April 23, A.M.

(9) Water Works Management Division
Safety in Construction/Plant/Office—A. J. Webb, J. E. Hickman, Thomas Allen
Works Simplification for Water Works—W. S. Deniger
Handling Customers and Employees—V. A. Appleyard, Kenneth Shull
Organizing the Team—Paul Weir

Wednesday, April 23, P.M.

(10) Water Works Administration Committee
Closed Session

Wednesday, April 23, P.M.

(11) Water Resources Division—General Session
Task Group Report—Ground Water Recharge—J. J. Baffa
Ground Water Reservoirs as Hydrologic Systems—J. G. Ferris
Panel Discussion—Recent Legislation Concerning Water Rights—Harry E. Jordan, Moderator; C. H. Bechert, H. C. Barksdale, John W. Cramer, Roy W. Morse, A. R. Davis, Lynn M. Miller
Whither Water Works Law—Abel Wolman

Thursday, April 24, A.M.

(12) Joint Session—Inter-American Association of Sanitary Engineering/American Water Works Association

Motion Picture—"Engineering Your Health"
A Review of Water and Sewage Sanitary Engineering Research — H. A. Faber
Report of Water Works Facilities and Construction Throughout the World — Fred Merryfield
Development and Operation of Municipal Water Systems in Mexico — Clicero Villafuerte, Pedro J. Caballero
Sanitary Engineering Educational Programs and Philosophies in Latin America — Daniel A. Okun

Thursday, April 24, A.M.

(13) MANAGEMENT/DISTRIBUTION DIVISION WORKSHOP
Research—Reduction of Water Mains Capacity — T. E. Larson
Research—Developing Protective Coatings for Water Mains — R. F. McCauley
A Study of Domestic Water Use — H. E. Hudson, Jr.
Meter Records the Basis for System Planning — Henry J. Graeser, R. B. Raw, A. R. Davis

Thursday, April 24, P.M.

(14) WATER PURIFICATION DIVISION WORKSHOP
Manganese Problems — A. E. Griffin
Manganese Research — Floyd I. Brownley
Iron and Manganese Reduction — E. J. Taggart, V. J. Calise
General Discussion on Manganese
Planned Research on Filter Washing — W. W. Aultman
Some Studies on Filter Washing — Raymond E. Hebert, John R. Baylis
Membrane Filter/Task Group Report — Richard L. Woodward, Ray L. Derby
Analytical Methods for Detergents — James C. Vaughn
Chlorine Standards and Research — H. A. Faber
Water Conditioning Devices — Rolf Eliassen

Thursday, April 24, P.M.

(15) WATER WORKS PRACTICE COMMITTEE—OPEN AND CLOSED SESSION
Selection of Protective Coatings for Valves — L. E. Tabor
Efficient Fire Hydrants — G. A. Wyss
Report on (1) Revision of Elevated Tank Standards
(2) Paints for Elevated Tanks — J. O. Jackson
Committee Report on Oil Line River Crossings — M. B. Cunningham

WSWMA Members to Exhibit at Dallas Meeting

97 Members of the Water and Sewage Works Manufacturers Association, Inc. will exhibit at the AWWA Meeting in Dallas Memorial Auditorium, Dallas, Tex., April 20-25, 1958.

Adams Pipe Repair Products
American Cast Iron Pipe Co.
American City Magazine, The
American Well Works, The
Armco Drainage & Metal Prod., Inc.

Badger Meter Mfg. Co.
Baker & Company, Inc., R. H.
Barrett Division
Allied Chemical & Dye Corp.
B-I-F Industries, Inc.
Brooks Products, Inc.
Buffalo Meter Co.
Burgess-Manning Co.
Penn Instruments Div.
Byron Jackson Pumps, Inc.

Centriline Corp.
Chicago Bridge & Iron Co.
Cla-Val Co.
Clow & Sons, Inc., James B.

Darling Valve & Manufacturing Co.
DeLaval Steam Turbine Co.
DeZurik Corp.
Dorr-Oliver, Inc.
Dresser Manufacturing Div.
Dresser Industries, Inc.

Engineering News-Record

Filtration Equipment Corp.
Fischer & Porter Co.
Fisher Research Laboratory, Inc.
Fexible, Inc.
Ford Meter Box Co., Inc., The
Foster Engineering Co.
Foxboro Company, The

Gamon Meter Div.
Worthington Corp.
General Filter Co.
Gifford-Hill-American, Inc.
Glenfield & Kennedy, Inc.
Golden-Anderson Valve Specialty Co.
Graver Tank & Mfg. Co., Inc.

Hach Chemical Co.
Hagan Chemicals & Controls, Inc.
Hammarlund Manufacturing Co., Inc.
Harco Corp.
Hays Manufacturing Co.
Hersey Manufacturing Co.

Industrial Chemical Sales Div.
West Virginia Pulp & Paper Co.
Inertol Co., Inc.
Infilco, Inc.
International Salt Co.

Johns-Manville

Keasbey & Mattison Co.
Kennedy Valve Mfg. Co., The
Koppers Company, Inc.
Tar Products Div.

Layne & Bowler, Inc.
Leopold Co., Inc., F. B.
Link-Belt Co.
Lock Joint Pipe Co.
Lone Star Steel Co.
Ludlow Valve Mfg. Co., Inc., The

McDonald Mfg. Co., A. Y.
McWane Cast Iron Pipe Co.
M & H Valve & Fittings Co.
M-C-G-Co., Inc.
Minneapolis-Honeywell Regulator Co.
Mueller Company
National Water Main Cleaning Co.
Neptune Meter Co.

Permutit Co., The
Div. of Pfaudler-Permutit, Inc.
Pipe Linings, Inc.
Pitometer Associates, Inc., The
Pittsburgh-Des Moines Steel Co.
Pratt Company, Henry
Preload Company, Inc., The
Price Brothers Co.
Public Works Magazine

Roberts Filter Manufacturing Co.
Rockwell Manufacturing Co., The
Ross Valve Manufacturing Co., Inc.

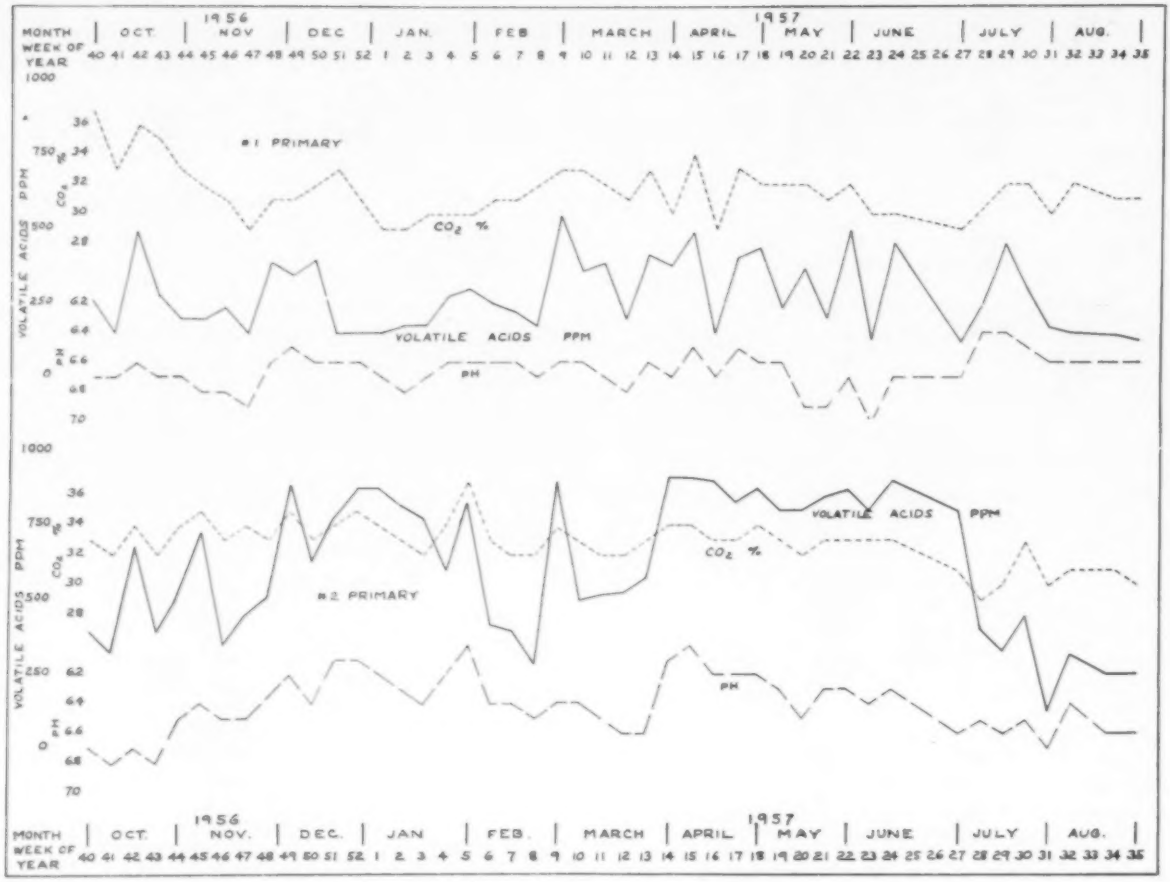
Sherman Products, Inc.
Simplex Valve & Meter Co.
Smith Mfg. Co., The A. P.
Smith-Blair, Inc.
Smith Company, S. Morgan
Sparling Meter Co., Inc.
Stuart Corp.

Trinity Valley Iron & Steel Co.
Tyler Pipe & Foundry Co.

United Concrete Pipe Corp.
United States Pipe and Foundry Co.

Vogt Mfg. Co.

Wachs Co., The E. H.
Walker Process Equipment, Inc.
Wallace & Tiernan, Inc.
Water & Sewage Works
Water Tank Service Co.
Water Works Engineering
Well Machinery & Supply Co., Inc.
Welsbach Corporation, The
Kitson Valve Division
Wheeler Manufacturing Co., C. H.
Economy Pump Division
Wood Company, R. D.



CARBON DIOXIDE, pH, and volatile acid determinations and data are used in Atlanta, Ga., to provide

3-Way Control *of Sludge Digestion*

by IRA C. KELLEY, Chemist, Sewer Division, Construction Department, City of Atlanta, Ga.

■ ALTHOUGH ATLANTA has experienced no recent undue trouble with sludge digestion—that is, foaming, loss of gas production, etc.—a "3-way control" or check on digesters is maintained.

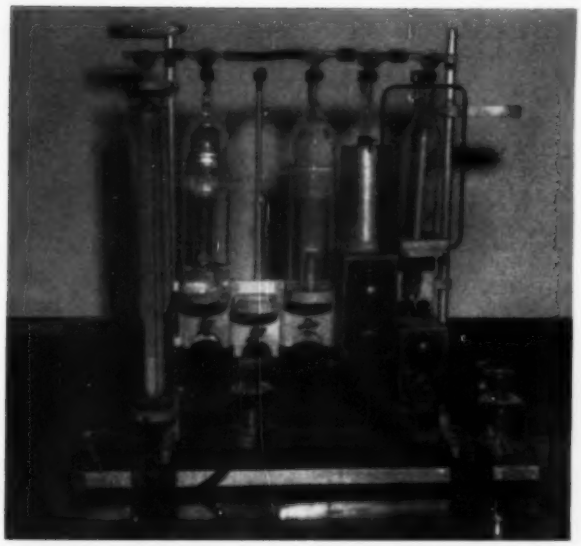
At present the City of Atlanta operates six sewage treatment plants, equally divided between primary and secondary treatment. Plans for enlargements at three of these plants and new ones to be built to serve the area are under way.

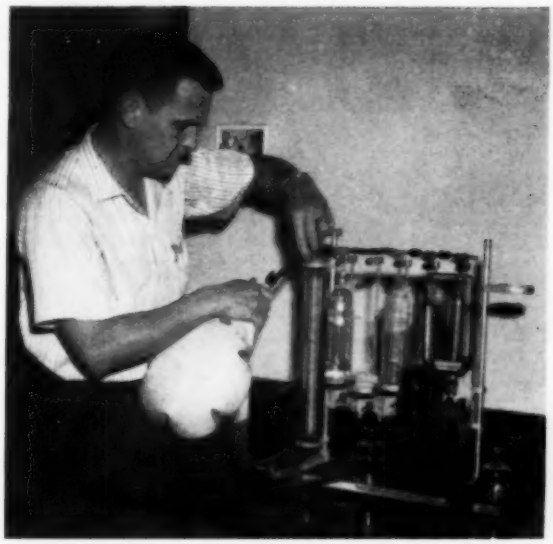
Currently, all tests are conducted at a central laboratory located at the R. M. Clayton sewage treatment plant. However, efforts are being made to furnish the necessary equipment for three of the larger plants in order that they may run their own control analyses.

The "3-way control" refers to carbon dioxide, pH, and volatile acids. Carbon dioxide is determined by the Orsat-type gas analyzer, in which the CO_2 is absorbed by a strong alkali. The volatile acids are determined by distillation of an acidified sample followed by titration with sodium hydroxide (this test is listed in Standard Methods).

Among the reasons for giving attention to more than one medium of control are the following:

1. Costly errors that way arise from dependence on only one test.
2. Errors introduced by reason of different personnel collecting the samples from the several plants.
3. Errors or changes resulting from storage and cross-town delivery to the





GAS ANALYZER tests for carbon dioxide, saturated hydrocarbons, hydrogen, carbon monoxide, methane, ethane, and nitrogen (by difference). Only two chambers on left are required for CO_2 determination. Samples of digester gas are brought to central laboratory in rubber bags, by author, for analysis.

laboratory of gas samples in rubber bags.

4. Errors made during actual analysis.

Nevertheless, the chances are slight that both the gas analysis samples and the sludge for the other tests might be simultaneously affected. Even after the importance of controlled sampling is realized, it is still deemed wise to make as many checks as possible for indications of trouble.

Number 1 and 2 primary digesters were cleaned at the R. M. Clayton plant during the summer of 1956. Figure 1 shows results of the three tests used in control of these units during eleven months following their recommissioning. Gas production is not listed due to a number of meter failures and the complications of bypassing between primary and secondary tanks during these times.

The primary digesters are 90 feet in diameter, 22 feet deep, and have flat bottoms. Each has a capacity of 127,234 cubic feet, and each has six turbo mixers. Six sets of six-coil heating tubes are suspended from the dome joists and approximately 75 per cent of digestion takes place in the primary digester. Digested sludge and gas are transferred by displacement to secondary digesters.

Number 2 primary was first to be cleaned and placed in service in July, 1957. First, the tank was filled with river water and heat was applied. This was followed by the addition of seed sludge from a nearby secondary digester until noticeable solids were evident. Next, increasing amounts of raw sludge were added, with an occasional two- or three-day rest.

No special attention was given at first to laboratory control, because of the shortage of personnel and additional work on plant and stream surveys for engineering data. No difficulty was encountered and digestion progressed to please the fondest hopes.

Meanwhile, work on Number 1 primary began and as October with its cooler weather and water temperatures approached, it was evident that greater care would have to be exercised in placing Number 1 primary in service. The same procedure was used in starting it as was used in the case of Number 2 primary. Then tests for carbon dioxide, pH, and volatile acids were started. Again, no one could ask that a digester behave in more orderly fashion.

The results for either digester (Figure 1) show marked similarities of the tests and their trends; even close study will reveal no great advantage of one test over another. No effort has been made to offset any test errors and results shown are taken directly from daily report sheets. It is well to run an analysis each day, or as often as possible, especially at times when there are indications of unrest in a digester. On the other hand, when gas production is going at an even pace, especially during the hot summer months, there is no need of checking as often and this time can usually be spent to better advantage doing other things.

If the author should have to choose between the three tests as to which is the most important toward digestion control, the test for carbon dioxide would be selected. The reasons for this choice are as follows:

1. Relatively inexpensive equipment is required (about $50 to $125 depending on whether the unit is a simple one for CO_2 only or a more complex one to test for methane and other constituents as well.

2. The low upkeep on the equipment.

3. The short time required to make the test.

4. The ease of teaching personnel to make the test correctly.

5. The better representation of the entire digester contents and their activity.

In any case, the "3-way control" has proven effective and will undoubtedly be relied upon in the future, at least until other tests prove more reliable.

Problems and considerations in the preparation of equitable controls for sewage and industrial waste through . . .

Sewer Use Regulations *by municipal ordinance*

are presented by DON E. BLOODGOOD, Professor of Sanitary Engineering, Purdue University, Lafayette, Ind. and Editor of Industrial Wastes.

MANY LAWS and regulations are required to keep our organized society functioning as it is intended. There are common, federal, inter-state and state laws that guide the cities of the United States in carrying on their activities. In the local communities there are ordinances that dictate what is best for the greatest number of people. These local regulations are very real to the people who are living under them. Consequently, the local administrations are vitally interested in the regulations and in many cases are called upon by the legislative group to help in the tentative formulation of the legal controls.

Of the many phases of local government the one dealing with sewage disposal is considered to be very important. The regulations governing the planning, financing, and construction are all very important. A fourth group of regulations, the ones that control the use of sewage disposal facilities, are also very important. In fact, this phase of regulation is neglected in some communities. The introductory paragraph to the Manual of Practice No. 3, Municipal Sewer Ordinances, of the Federation of Sewage and Industrial Wastes Associations[1] says, "Of all public utilities, sewage collection systems are probably most abused through misuse. This situation has come about because of (1) a common misbelief that a sewer can carry away any unwanted substance or object that can be put into it, (2) the lack of adequate regulations setting forth the proper uses and limitations of the system, and (3) the lack of complete enforcement by municipal authorities of existing regulations."

These same statements apply to the use of sewage disposal facilities. In recent years many new ordinances have been written but there are still many cities with no regulations or very antiquated regulations for the protection of the sewers and sewage disposal plants. Sewers and sewage disposal plants exist for the purpose of disposing of unwanted materials in a community, therefore, it is necessary for those who direct the preparation of legal controls to keep this fact in mind.

The classes of materials that are disposed of in sewers and treated in sewage treatment plants are domestic sewage, garbage and industrial wastes. Under certain conditions it may be possible to dispose of all three by the same sewers and sewage treatment process, while in another situation it may be advisable to regulate against such a procedure.

Distribution of Costs

In any event, there should be a suitable arrangement to have the costs of collection and disposal distributed equitably. The lack of such an arrangement has been a deterrent in some instances to the combined treatment of all three classes of wastes. The distribution of costs is done in many ways; one of the best guides in the selection of a method is Bulletin No. 7, "Sewer Rentals," by the American Public Works Association.[2] They also have published Special Report No. 18-S, "Industrial Waste Disposal Charges in Cities Over 5,000 Population"[3] and Special Report No. 18 "Sewage Service Charges in Cities Over 5,000 Population."[4]

If the sources of wastes are in existence prior to the construction of collection and disposal facilities, costs should not be a reason for excluding any wastes unless they can be shown to be a hindrance to the proper collection and treatment of any one of the waste classifications.

Importance of Bacteria

The municipal sewage treatment plant is built for the purpose of protecting the public health by disposing of the human wastes that contain pathogenic bacteria that may be present. The domestic wastes also contain organic matter that can be decomposed by natural bacterial flora that find the organic materials in sewage suitable for food. This process of decomposition of orangic matter by bacteria is nature's way of keeping the world in chemical balance. The modern sewage treatment processes for domestic waste disposal are the natural processes harnessed to do the required work in a confined area or volume.

It is known that certain bacteria can and do purify domestic wastes and in a more satisfactory and economical way than by any other means presently known. Therefore, if the activated sludge, trickling filter or sludge digestion processes are to be used it is necessary to prohibit the discharge of any substance that will be detrimental to the bacteria being relied upon to do the purification. Such a requirement, if written into an ordinance, could be, if literally taken, a law prohibiting the admission of minute quantities of any substance into the sewer system. For practical reasons this cannot be the case and it then is necessary to determine equitable controls on the wastes discharged.

Wisely[5] has said, "There is certainly no question but that many problems of sewage treatment can be eliminated or partially solved by the proper regulation of the usage of the sewage

collection system. Without proper control, a public sewer system cannot render completely satisfactory service; it becomes a hazard to the public safety and entails a substantial waste of funds used for original and corrective construction."

One Plant Treatment

It has been stated that it is more economical to treat a quantity of waste in one plant than it is to do the same work in two separate plants. This is true if the materials to be handled are all compatible in a treatment process. By this philosophy it would be possible for municipal sewage treatment plants to take care of all industrial wastes. As is well known, this has not been the policy for the years gone by. There must be some reasons then why municipal sewage treatment plants do not take all industrial wastes and treat them along with the domestic sewage.

Difficulty in Writing Regulations

It is most difficult to write regulations on the discharges of industrial wastes to sewer systems because of the variation in conditions that may exist. As an illustration, when pickling liquor containing ferrous sulfate and sulphuric acid is discharged as a waste material into a concrete sewer without dilution the waste will destroy the concrete; if however, the pickling liquor is discharged into a sewer that has a considerable flow of sewage with considerable natural alkalinity the acid will be neutralized and the iron precipitated. In some activated sludge plants the iron oxide actually appears to be an aid to the process. In one municipal plant in Indiana the pickling liquor does not injure the sewers but the iron does coat the air diffusion tubes in the aeration tanks and causes some clogging. It appears, then, that it is quite difficult to set down hard and fast regulations regarding the discharge of some materials into municipal sewers.

There are some materials that are discharged to sewers that could be much more easily disposed of if they were not mixed with sewage.

Inert Solids

Such materials as sand, ashes and cinders can be taken out of sewage in the grit chambers of a sewage plant but when they are a mixture of organic and inorganic materials and it may, therefore, be difficult to dispose of them. Sand and other heavy inert materials may settle out in sewers and cause stoppages. There is a record of a sewer stoppage with ground glass that came from a washing plant processing broken bottles. It would sound peculiar in some communities to have a statement in an ordinance that said no broken glass shall be discharged to the sewers. If for some reason a foundry wished to dispose of its waste sand from a reprocessing plant by discharging it to the sewers, it could be removed by the grit chambers if it could be transported to the sewage plant. The sand removed at the sewage plant would not be as satisfactory for fill as it would have been if it had been removed directly from the foundry.

Oils and Solvents

The discharge of gasoline and other volatile, combustible solvents cannot be tolerated in a sewer system or a sewage treatment plant. The explosive solvents are dangerous in sewers and in pumping stations and it takes very little of them to cause serious trouble. Oils, whether light or heavy when received at the plant in the sewage, are not decomposable in the biological treatment plants. The lubricating oils may coat the sewage solids with films that cannot be penetrated by the oxygen that must get to the bacteria if they are to decompose the organic matter. Small quantities of oils discharged daily may accumulate in the digestion tanks of a city sewage plant, particularly is this true if the skimmings from the primary settling tanks are pumped to the sludge digestion tanks. The oils interfere with the biological processes and should, therefore, never get into the sewer.

It is not practical to rule that it is a criminal offense to add a thimble full of oil to a sewer, but certainly any filling station that discharges waste crankcase oil to the sewer should be required to take steps to prevent such a discharge, even though the discharge might amount to only a few parts per million in the total sewage flow.

Feathers and Hair

Feathers in sewage are very troublesome and they can cause a tickling filter to be ineffective because of the constant clogging of the filter nozzles. Feathers in a poultry packing plant can be quite easily collected so it seems only reasonable that they be excluded from sewers and sewage plants.

Hair from tanneries or meat packing plants can be removed by sedimentation but the hair in the sludge is not readily digested. It has been known to collect as a sludge mat on the top of a digestion tank, thus interfering with gas release. In these days of sludge recirculation it may be possible to keep the hair in suspension and move it on out of the tank with the digested sludge. It does not seem reasonable to require a sewage treatment plant to remove hair in large quantities.

Garbage

There are some communities that have written ordinances prohibiting the discharge of ground garbage to the sewer system. Such regulations do not seem to be reasonable in many ways. The collection and disposal of garbage like the collection and disposal of sewage, is usually a municipal responsibility. Garbage is organic matter of much the same chemical nature as sewage solids, therefore, it decomposes in much the same manner as do sewage solids. The garbage, when properly ground will be of a size that will classify it as primary sludge. It can be pumped without trouble as primary sludge and it will digest with sludge, producing gas of approximately the same quality as sewage gas. If the garbage is ground in the homes any grit-like material will be removed in the sewage plant grit chambers so that there will be no great accumulation of grit-like materials in the bottom of the digestion tanks. It has been shown by the experience at Jasper, Indiana, that ground garbage causes no trouble in the sewer system. One often hears the statement that garbage will overload the sewage plant. This may be true but it seems only logical to say that an enlarged sewage plant can be built and operated to handle ground garbage without detriment to the functioning of the sewage treatment plant. There really seems to be no good reason to exclude garbage that has been ground in homes.

Water Softening Sludge

Some cities have found that the use of water softening sludge has been helpful in the treatment of sewage by a particular process that attained less than the maximum possible removal of polluting material from the sewage. It is quite foolish to think that water softening sludge from a municipal softening plant can be handled in a sewage plant where an attempt is being made to digest the sludge. These same comments apply to acetylene generation sludge.

Volume Fluctuations

Volume fluctuations cause no difficulty in sewers but major changes in rate of sewage flow cause considerable difficulty in sewage plant operation and the sewage plant usually has no way to iron out flows unless they have a large sewer that can be used as a reservoir. This is done in Gary, Indiana where the rate of pumping is almost constant for each 24-hour pe-

riod. A city can hardly be expected to provide volume for leveling out variations in flow.

Temperature

Temperature of wastes may result in problems under certain conditions. If a large volume of warm water is mixed with sewage the elevated temperature may bring about rapid bacterial decomposition with the resulting odors being a nuisance. Activated sludge as well as trickling filter operation is speeded up with temperatures up to about 42°C. This statement would indicate that the addition of warm water to a sewer might be a benefit. Extremely hot water may be harmful to jointing compounds in sewers. Extremely cold water may retard bacterial action in sewage treatment plants.

The problem then arises as to a suitable way to regulate against the discharge of wastes with unusually high or low temperatures. A quart of either hot or cold water would not be harmful in any sewer, but to determine the amount that will be harmful is most difficult.

When a regulation is written stating that "wastes with temperatures higher than 150° shall not be discharged," the industries in a community are worried because they are fearful that some unreasonable municipal executive will be in authority at some time in the future and require that the industry be required to decrease the temperature of their waste water, perhaps amounting to only 1000 gallons in volume, before it is discharged into the sewers that carry a flow of a million gallons or more a day.

Acidity-Alkalinity Limits

One of the limiting factors in ordinances that is debated is that of pH limits. Bacteria that do purification work are sensitive to pH and they usually have an optimum pH at which they are most active. Therefore, variations from the optimum are detrimental to sewage treatment. The pH of sewage also is important from the standpoint of life of the sewer. Acids and alkalies are the enemies of sewers not made of vitrified materials but if the sewers are made of materials to withstand the acids and alkalies, the sewage treatment organisms are adversely affected. Many of the sewages in this country are alkaline in nature and can neutralize considerable acidity. Again we have before us the situation where it is quantity that is important and not the presence of any small amount.

Toxic Materials

The materials that are known to be toxic to bacteria are bound to be troublesome in biological treatment if there is an amount of toxic substance that will noticeably retard bacterial growth or activity. Copper, one of the metals that is known to be detrimental to organisms cannot be removed from sewage with any successful method at the present time. To expect a sewage plant to remove copper and then remove the organic matter is more than can be hoped for. The processes for removing copper and treatment of organic matter are not compatible. This, then, gives a reason for eliminating wastes from sewers if these wastes cannot be successfully treated by the process used to treat the sewage. This same reasoning applies to the other toxic substances such as chromium, zinc and cyanide.

It must be remembered, however, that some toxic substances lose much of their toxicity when mixed with sewage. Copper sulfate may be precipitated thus removing it from the liquid but it may accumulate in the sludges where it has been reported to be harmful to the digestion process.

Ordinance Limits

Some ordinances place a limit on concentration of total, dissolved and suspended solids as well as Biochemical Oxygen Demand (B.O.D.). These limitations are usually placed so that there can be an equal distribution of costs of treatment. If this is true, there should be no penalty for concentrated wastes. In fact, it costs money to handle liquid so there should be some slight advantage to a discharger if he throws away a concentrated waste, if he is paying for treatment on the pounds of solids or B.O.D. that are being discharged to the sewer system.

Many times a need is expressed for regulations because an industry is blamed for the discharge of some objectionable substance. Industries are not all "lily pure" but many of them do try to maintain a discharge from their plants that will not be injurious to the municipal sewage plant. Several years ago an industry was blamed for the lack of gas from the municipal sludge digestion tank. The findings were that there was an open valve permitting the sludge gas to escape to the atmosphere.

A meat packing plant that discharges all paunch manure to a sewer that goes to a sewage plant equipped to handle only normal amounts of grit should be informed of the difficulties being experienced. If the sewage plant must handle the paunch manure, then the industry should provide the necessary equipment to remove the paunch manure from the sewage and pay for the extra cost in handling.

Summary

From the statements and examples it might appear that there seems to be no good way to prepare regulations for the protection of sewers and sewage treatment facilities. There are, however, guiding limits that are helpful in determining what is reasonable. It is not set out anywhere whether limits should be placed on the sewage quality at the treatment works or on the effluent that is discharged by an industry. An acid discharge that corrodes the city sewer at the point of discharge to the city system is much too acid and cannot be tolerated even though the acid may be completely neutralized by the time the sewage reaches the treatment works.

The day that someone writes a perfect regulation will be welcomed by everyone. Until that day arrives it will be necessary to rely upon the good judgment of those who discharge wastes and those who are in charge of the collection and treatment of sewage.

It is apparent from the survey reported by Byrd and Gex[6] that there are situations regarding industrial waste discharges that have not been met by existing regulations. They said that 61% of the municipal respondees to a questionnaire stated that in varying degrees difficulties from industrial wastes were encountered; however, only 17% reported difficulties not solvable at the treatment plant. This seems to indicate a need for a further study of ways to write regulations so that they bring about an equitable solution to the preparation of regulations that are fair to everyone.

References

1. Manual of Practice No. 3, Municipal Sewer Ordinances, Federation of Sewage Works Associations, 1949.
2. Bulletin No. 7, Sewer Rentals, American Public Works Association, 5th Printing, 1948.
3. Special Report No. 18-S, Industrial Waste Disposal in Cities Over 5000 Population, American Public Works Association, 1955.
4. Special Report No. 18, Sewage Service Charges in Cities Over 5000 Population, 1953.
5. Wisely, W. H., "Regulations of Sewer Usage," Sewage Works Journal, Vol. 16, No. 5, Pg. 972 (September, 1944).
6. Byrd, J. F., and Gex, V. E., "Combined Treatment of Industrial and Municipal Wastes — An Industrial Viewpoint," Sewage and Industrial Wastes, Vol. 29, No. 4, Pg. 414 (April, 1957).
7. Sawyer, C. N.; Howard, F. S., and Pershe, E. R., "Scientific Basis for Liming of Digesters," Sew. Wks. Jour., Vol. 26, No. 8 (1954).

ELEVATING CONVEYORS in preaeration grit chambers at Jefferson County (Birmingham, Ala.) sewage treatment works are part of a modern . . .

Grit Handling System

by FRED E. STUART, JR., Engineering Department, Stuart Corp., Baltimore, Md.

■ JEFFERSON COUNTY, Ala. placed its Village Creek sewage treatment plant in operation late in 1955. Its tributary area comprises mainly the city of Birmingham, which maintains and controls the lateral sewer system and passes the sewage to interceptors and trunks that are maintained by the county.

Plant Units

The Village Creek treatment plant is designed for a flow of 40 mgd, with provisions for increasing this capacity as it becomes necessary. Entering sewage passes through coarse screens with bars on 6-inch centers, and passes into four large pre-aeration basins with a designed capacity of 10 mgd each. Swing diffusers provide the separation of organic and inorganic grit in the pre-aeration basins.

The effluent of the basins then passes through two large Barminutors into four sedimentation tanks. After 1-hour detention the solids from the sedimentation tanks are pumped approximately ¼ mile to nine digesters, including three old 75-foot diameter and six new 100-foot diameter digesters, with three primary and three secondary gas holder units.

Gas produced in the digesters is compressed into a 50-foot diameter Hortonsphere at a pressure between

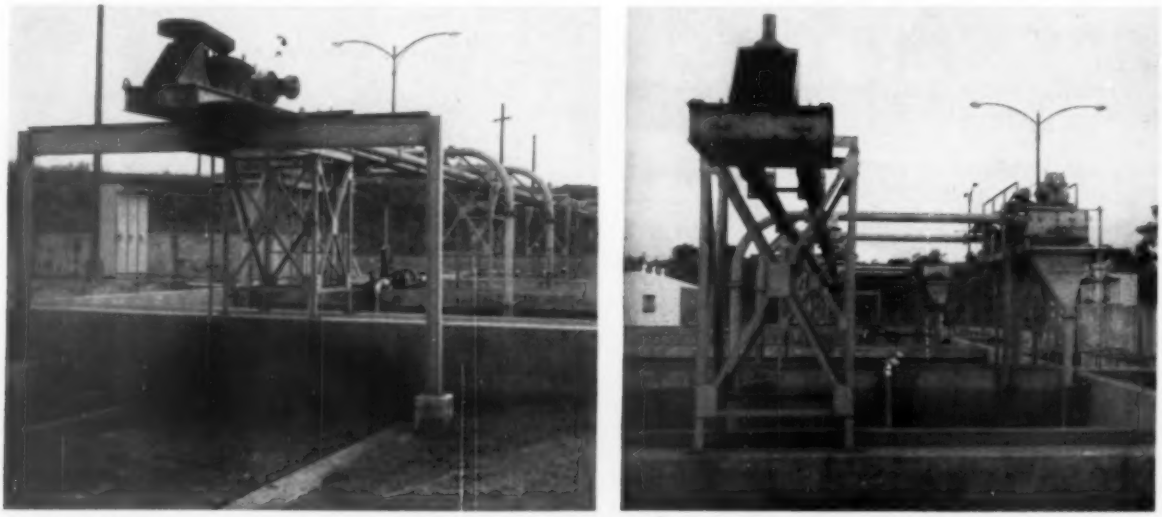
PREAERATION grit chambers with grit elevating equipment precede four sedimentation tanks, from which sludge is pumped to nine digesters. Sludge digestion tanks, incineration building and Hortonsphere appear in distance.

25 and 50 psi. This gas is used for heating the digesters, buildings, and flash drying system. The supernatant from the digesters is pumped back into the raw sewage entering the plant, prior to pre-aeration. The digested sludge, after passing through two-stage elutriation, goes to vacuum filters; the sludge cake is then dried in a large C. E. flash drying system and sold as fertilizer.

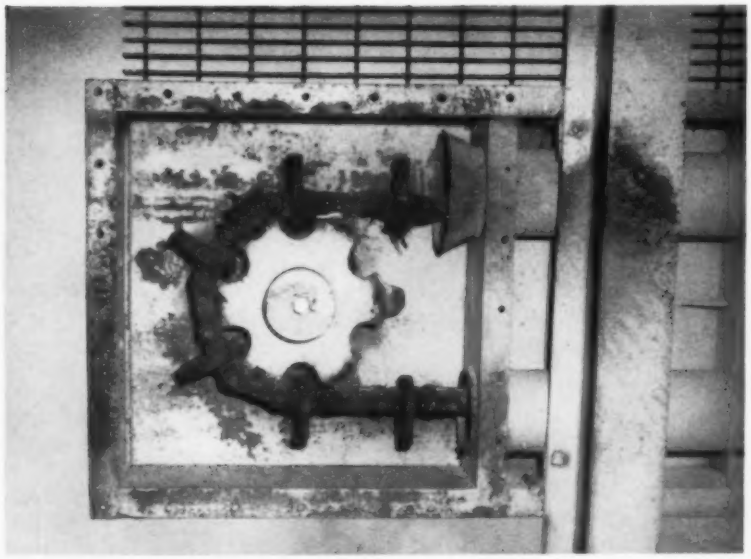
Grit Removal System

Contained in the first 20 feet of each pre-aeration basin is a grit removal section. The inorganic grit entering the pre-aeration basins is separated by the swing diffuser and falls into a sloping sided grit hopper 8½ feet long. This heavy inorganic grit is conveyed 27 feet upward by a neoprene-flighted sealed-pin tubular conveyor manufactured by Hapman Conveyors, Inc., of Kalamazoo, Mich.

Grit from the elevating hoppers discharges by gravity through a closed discharge hopper into the main transfer conveyor. This transfer conveyor removes the grit to a truck port located at the side of the pre-aeration basins for eventual removal to waste. Each of the elevating conveyors has a total length of 91 feet and the sealed-pin chain operates in standard 6-inch



MAIN TRANSFER conveyor drive mechanism and discharge port to trucks (left) and view from opposite end (right). Conveyor flights run in 6-inch pipe around corners and without metal-to-metal contact.



SEALED-PIN CHAIN returns around tail sprocket. Disc-like flights are rubber bound to reduce wear due to grit abrasion.

pipe.

Each elevating conveyor has a nominal capacity of 1.5 cubic feet per minute operating at a chain speed of 100 feet per minute. A 1.5 hp, 1750-rpm, 3-phase, 60-cycle motor operating through a Foote Brothers heavy-duty gear reducer powers the elevating conveyors. Each flight has an outside diameter of approximately 5½ inches, thereby allowing a slight flow back of liquids during conveyor operation.

Novel Conveyor Chain

The method of assemblying the conveyor chain is rather novel and has many advantages in the handling of abrasive materials. The steel pin that connects the two side links to the center link containing the flight is surrounded by neoprene rubber washers between all points of potential metal-to-metal contact. Before the insertion of the cotter pin, a C-clamp is used to slightly compress the neoprene washers. This compression allows the chain to twist without losing the effective seal on the pin.

The term "sealed pin chain" derives its name from this seal, which is extremely important in handling abrasive materials such as sewage grit. The grit cannot get to the pin during normal chain flexing, and in turn metal-to-metal contact within the chain has been eliminated.

The main transfer conveyor's function is to remove the grit from the four elevating conveyors to the side of the pre-aeration basins. This conveyor has a total length of 280 feet, and is constructed of 6-inch pipe. It is powered by a 10-hp motor geared through a heavy-duty gear reducer.

The conveyor is designed to have a nominal capacity of 6 cubic feet per minute to allow it to remove the grit from the elevating conveyors all running simultaneously. The output shaft of the heavy-duty gear reducer is connected to a sprocket wheel whose teeth engage in the sealed-pin chain. The grit is pulled to the drive and falls away from the sprocket wheel to the waiting truck.

Neoprene rubber is used on the outer edges of all flighting within the tubular conveyors. The resiliency of the neoprene rubber allows the flight to be dragged through the conveyor piping in the presence of highly abrasive grit without appreciable wear. There is no metal-to-metal contact within the conveyor piping. All turns are case hardened for additional strength within the conveyors.

During the summer months, while the plant is operating at its design rate of 40 mgd, the conveying system removes an average of 60 cubic feet of grit every 24 hours. Each shift operates the conveying system until the collected grit is removed, usually taking from 45 and 60 minutes per shift. The weight of the grit varies throughout the year, depending on the content of the grit, but generally exceeds 70 pounds per cubic foot.

Because the conveyor system is a closed circuit, odor is kept to an absolute minimum. The conveyors are quiet in operation due to their lack of metal-to-metal contact.

Personnel

W. F. Chandler, Jr., Superintendent of the Village Creek Sewage Treatment Plant and his personnel have been very pleased with the efficiency and smoothness of operation of the conveying system.

The plant was designed by J. W. Goodwin Engineering Co., consulting engineers of Birmingham, Ala., and is under the over-all supervision of R. C. Barton, Chief Sanitary Engineer of Jefferson County. W. F. Chandler, Jr., is superintendent of the plant.

A Water Code; and a Well That Will Never Go Dry

In an effort to bring fresh, pure water to an isolated village in Western Nigeria, a World Health Organization engineer supervised the digging and finishing of a well. It was 150 feet deep, concrete lined, with a brick wall above ground level and a winch with a steel cable for raising and lowering the bucket. But when the engineer returned to the village some time later he found that the well had not been used. After a long palaver, he learned the reason. It seems that the villagers had definite rules about who was to do a certain kind of work. It was the men's job to do mechanical work and the women's to carry water. Raising the water to the well head was something in between. The women flatly refused to turn the winch, a man's job; the men refused to do women's work, getting water.

The women continued to walk several miles to a stream and back, carrying water jugs on their heads. When summer came and the stream dried up, they went to a stream farther away, near another village, until the people of that village refused to let them use "their" stream. Even then the people didn't violate their men's work-women's work code and use the well—although for several days the village had no water at all.

The editor's comments

A W W A

This is the month when the American Water Works Assn. meets in Dallas, Tex. for its 78th annual convention. It is the month when AWWA will reach a new high in membership of nearly 12,000.

In honor of the AWWA, this month *Water & Sewage Works* has devoted nearly 85 per cent of its pages to articles and news on water and water supply. By way of equalizing matters, the October issue will be devoted mainly to sewage disposal topics and the Federation of Sewage and Industrial Wastes Assns.

O W W A

Yes—OWWA may well become a symbol as important to the water works industry as AWWA, for OWWA stands for "Operation Water Works Advancement." OWWA is the highly important new activity of AWWA, designed to acquaint the public with need for and importance of an adequate water supply in community life and to lead toward improved water service and improved training for water works managers.

Elsewhere in this issue appears a report on the action of the AWWA Board of Directors at its annual meeting last January. Included in that report is a briefed version of the summary of the report of the Ad Hoc Committee on Public Information. It is expected that the full report of this committee will become available to all AWWA members in the April issue of the *Journal*. The full report not only sets forth the needs for such an activity but it also contains a thorough analysis of the present road blocks to advancement of the water works industry and an orderly detailed outline of a plan of campaign.

The committee proposed that Operation Water Works Advancement should have a slogan and an objective. The slogan: "Good Water is the Life Blood of Your Community" and the objective: "Improved Water Service, Through Water Works Systems, Self Sustained and Adequate to Meet the Growing Needs of Each Community."

Among the roadblocks to the program are:

1. Lack of appreciation by the public of the importance of water supply to the community health, fire protection and growth.
2. Lack of realization on the part of water works managers that good public relations are essential to deloping good water service.
3. Lack of realization by customers and public of what adequate water supply means and how demands are increasing.
4. Lack of anticipation by water works managers of the urgency of growth demands on water supply and particularly of this axiom: "In the business of water supply, ten years from today is *now*."

The committee proposed that all avenues of approach and all possible implements of public relations be utilized in the operation: Professionally made movies, brochures, articles in the technical and public press, a speakers bureau, papers and discussions on local section programs, short schools for water works managers and increased use of "Willing Water," etc.

One of the most important recommendations of the committee was that "in order to develop the AWWA Public Information Operation a qualified man be appointed as field representative."

A vote of thanks is due to that committee of Fred Merryfield as Chairman and John H. Murdoch, Jr. as Consultant with members Messrs. Amsbary, Arnold, Finch, LaDue and Moses—and commendation is due also to the Directors who voted to dip into cash reserves this year to implement this desirable program.

Short Schools for Water Works Managers

For many years short schools for water and sewage works operators have been held at perhaps 40 colleges or universities. Individual AWWA sections and sewage associations have held "schools" as a regular or irregular part of technical programs. For the most part, these short schools have dealt with process operation, maintenance, quality, etc. Few short schools have dealt with management except for an occasional paper.

John H. Murdoch, Jr. who was Consultant to the AWWA Ad Hoc Committee on Public Information, not only has decried this lack but he proposes to do something about it. As President of the Penna. Water Works Assn., an organization of private water utilities in Pennsylvania, Mr. Murdoch is scheduling a water works Managers Short School for the meeting in October.

Unlike previous meetings of this organization which have been closed to non-members, this meeting, to be held in Atlantic City, Oct. 14-17, 1958, will be open to any water works superintendent or manager.

For the program, Mr. Murdoch has already scheduled these topics and speakers: "Philosophy of Water Works Management" by Abel Wolman; "Characteristics of Good Water Works Managers" by Frank C. Amsbary; "Use of Physical and Operational Data by Managers" by Wendell R. LaDue; "Manager's Use of Financial Statements" by David Dunlap; "The Manager's Relation with the Public and Customers" by Oscar Newquist. Two other topics scheduled include "Manager's Relations with Investment Bankers" and "A Defense of the Profit Motive."

George E. Symons.

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FLUSH KLEEN®
Sewage Pumps
. . . because they never clog!
Solids Never Reach The Impeller, Resulting In . . .
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Proven Performance Verified By Over 7,000 Installations.
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unsurpassed for slurry service!

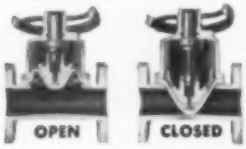
STRAIGHT-THROUGH FLOW

- Minimum pressure drop — maximum flow
- Handles viscous materials without stoppage (freedom from clogging and obstructions)
- May be rodded or brushed out (without damage to valve or lining and without removing bonnet)
- Throttling characteristics approach a straightline function

ADVANTAGES
of a diaphragm valve

- Positive closure, even with gritty or fibrous materials
- No pockets to trap sludge
- Bonnet mechanism completely isolated from fluid in line
- Completely self-draining
- Simple maintenance

Face-to-face dimensions are completely interchangeable with standard Grinnell-Saunders Diaphragm Valves — and require no more space. Straightway Valves are available in a variety of body, lining and diaphragm materials (except plastics diaphragms). Also, available in sizes ½" to 8" — plus two new body sizes, 10" and 12". Handwheel or power operation. Write for detailed facts.



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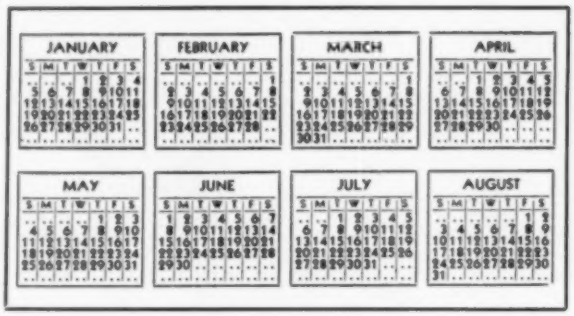
WHENEVER PIPING IS INVOLVED
Grinnell Company, Inc., Executive Offices, Providence, R. I.
Sales Offices and Warehouses in Principal Cities

Meetings

1958



Apr. 10—Oakland, Maine
MAINE WATER UTILITIES ASSN., Secy., Gerard F. Laurin, 89 Western Ave., Augusta, Maine

Apr. 16-18—Lincoln, Neb. *(Cornhusker Hotel)*
NEBRASKA SECTION, A.W.W.A., Secy., John E. Olsson, 408 Sharp Bldg., Lincoln, Neb.

Apr. 17—West Springfield, Mass.
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, 73 Tremont Street, Boston 8, Mass.

Apr. 18—Harrisburg, Pa. *(Penn-Harris Hotel)*
ANNUAL CLEAN STREAMS CONFERENCE, Secy., R. V. Wall, Pa. State Chamber of Commerce, State Chamber Bldg., Harrisburg, Pa.

Apr. 20-25—Dallas, Tex. *(Memorial Auditorium)*
A.W.W.A. CONVENTION, Secy., Harry E. Jordan, American Water Works Assn., 2 Park Ave., New York 16, N. Y.

Apr. 20-25—Dallas, Tex. *(Memorial Auditorium)*
SOUTHWEST SECTION, A.W.W.A., Meeting in Conjunction with National Convention A.W.W.A., Secy., Leslie A. Jackson, Municipal Water Works, Robinson Memorial Auditorium, Little Rock, Ark.

Apr. 23-26—Stockton, Calif. *(Hotel Stockton)*
CALIFORNIA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Robert J. Barletta, 719 South Loara St., Anaheim, Calif.

Apr. 28-29—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA INDUSTRIAL WASTES & SEWAGE WORKS ASSN., Secy., O. J. Hand, c/o Hercules Powder Co., Hopewell, Va.

May 5-7—Lafayette, Ind. *(Purdue University)*
13TH PURDUE INDUSTRIAL WASTE CONFERENCE, Chairman, Prof. Don E. Bloodgood, Purdue University, Lafayette, Ind.

May 5-7—Lafayette, Ind. *(Purdue University)*
CENTRAL STATES SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Scott E. Linsley, P. O. Box 3598, St. Paul 1, Minn.

May 15—Brattleboro, Vermont
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, 73 Tremont Street, Boston 8, Mass.

May 15-17—Spokane, Wash. *(Davenport Hotel)*
PACFIC NORTHWEST SECTION, A.W.W.A., Secy., Fred D. Jones, Asst. Supt., Water Dept., 306 City Hall, Spokane, Wash.

CONTINUED ON PAGE 122A

Automatic Filter Backwash System Simplifies Operation...

Safeguards Filters in New Water Plant

B-I-F Case File
Town of Tonawanda, N. Y.

Consulting engineers for this plant were:
Nussbaumer, Clarke & Velzy, New York City & Buffalo, N. Y.

Mechanical equipment furnished and installed by:
George A. Bass Construction Co., Birmingham, Mich.

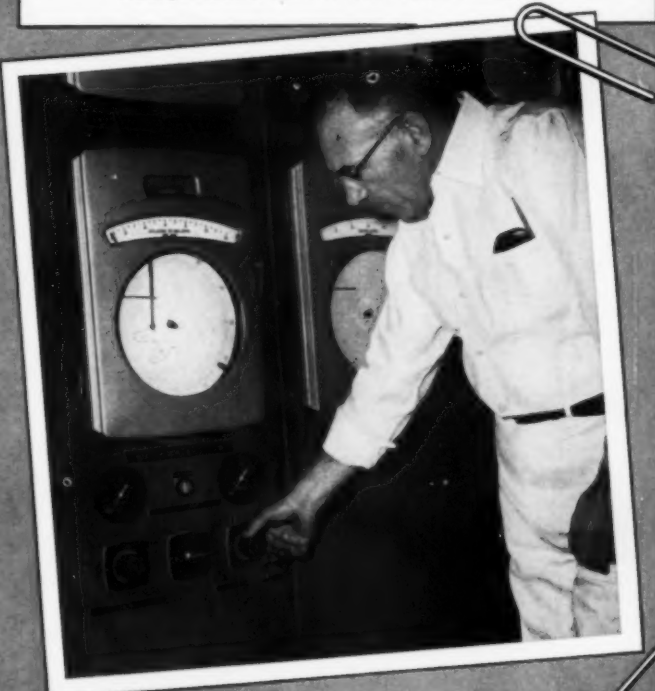
By the use of Builders Auto-Central filter backwash control, this modern $5,000,000 Water Plant has been able to attain high operating efficiency with minimum operating staff and supervision. The plant supplies some 90,000 people in the Town of Tonawanda, and currently operates at about 50% capacity, or 8 MGD.

Auto-Central Control Promotes Efficiency, Saves Time, Prevents Filter Upsets due to Faulty Equipment Operation.

When one of the plant's eight filters requires washing, the operator presses the start button associated with the particular filter. The proper valves operate in their correct sequence to drain the filter, apply backwash and surface wash flows in precisely regulated quantities, and then return the filter to service automatically. At the election of the operator, any or all of the operations can be performed manually.

One Responsibility for Complete System

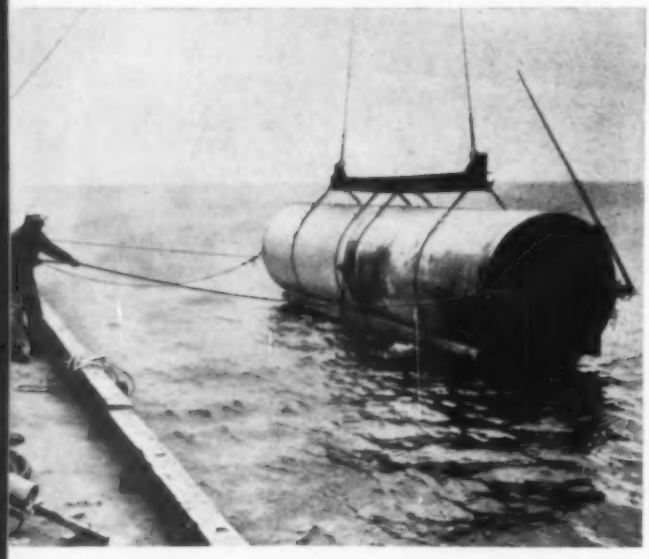
All the filter controls and meters for this plant were purchased from Builders-Providence, a balanced system designed by water works specialists for water works service. The wisdom of relying on a single responsibility for this equipment is being proven by the day-to-day efficiencies and economies produced by Builders Water Works Equipment here, and in thousands of other municipalities.



One of the eight filter control consoles

Clarence A. Davis, Plant Supt., reports Builders-Providence equipment at Town of Tonawanda, N. Y. Water Treatment Plant has proved "very satisfactory."

BUILDERS-PROVIDENCE
DIVISION OF
B-I-F INDUSTRIES
PROVIDENCE, RHODE ISLAND
METERS FEEDERS CONTROLS



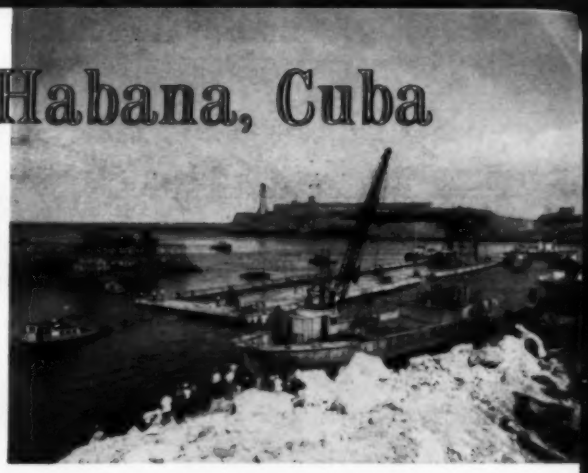
2½ Miles of Pipe For The Bottom of Lake Erie

Each piece of pipe you see above stands 24 feet high and weighs 36 tons. We made 535 of them at our Cleveland plant for the City of Cleveland's new raw water intake. The 96-inch ID concrete subaqueous pipe with rubber and steel joints was installed by Merritt-Chapman & Scott and will have a 150 mgd capacity. For information on concrete pressure pipe from 16-inch on up, write Price Brothers headquarters plant, Dayton, Ohio or Hattiesburg, Mississippi.

Price Brothers

Tunel de la Habana, Habana, Cuba

Remarkable engineering accomplishment, protected from water with the **Thoro System Products**



Four-lane, underwater tunnel, connecting Malecon Drive, City of Havana, Cuba with Guanabacoa near the famous Morro Castle, opening the sparsely-populated peninsula to residence and commercial activity.

Design, engineering and construction by Societe des Grand Travaux de Marseilles, Paris, France, 733 Meters Long, 23 Meters Wide, 7 Meters High, cost $28,500,000.00. Waterproofed inside and outside with THORO System products, THOROSEAL, WATERPLUG and THORITE.

Mammoth precast concrete sections are floated to location by attached pontoons, lowered 24 meters under water and connected to previously-sunken sections. ***Note the famous Morro Castle. Top, center background.***

rom Havana side, tunnel entrance grades own to harbor pool level.

wo double-lane tunnel sections take shape; orms will be filled with poststressed concrete.

Precast sections of tunnel, honeycomb patched with THORITE Patching Mortar and entire surface protected with THOROSEAL.

Thoro System Products applied, completes the job!

Preparing interior surface for WATERPLUG and one brush and one trowel coat of THOROSEAL. All walls, floors and ceilings are sealed with THOROSEAL.

THOROSEAL is being applied to all interior surfaces. Over 800 drums of WATERPLUG have already been used, where water was entering and where sections were joined together. All honeycomb and construction faults were sealed with THORITE Patching Mortar, before lowered to position in the bay.

Thousands of drums of THOROSEAL, WATERPLUG and THORITE Patching Mortar are being used on this vast project.

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Standard Dry Wall Products, Inc.

NEW EAGLE, PA. CENTERVILLE, IND.

All over the country more and more Sewage Treatment Plant Operators and Professional Sanitation Engineers say:

"Sure we were fooled once, but not again. Now we specify 'Cloroben', not 'Cloroben or equal'. Because we've learned the hard way that Cloroben has no equal!"

Only **CLOROBEN** has the precise formulation of chlorinated hydrocarbons processed in exactly right proportion with special and exclusive dispersing agents.

You find that the more difficult your odor or sanitation condition, the more definite the proof that **CLOROBEN** *is more than twice as effective as slightly cheaper substitute emulsifiable chlorobenzes.*

To control odors and suppress sulfide formation in sewage, for septic tanks, cesspools, chemical toilets, no other product of its kind compares to **CLOROBEN** in safety, efficiency and true economy.

Specify and use **CLOROBEN**, and only **CLOROBEN**, for results you know you can depend on.

Yours on request: Technical Brochure, complete with evaluation and performance data, and describing **CLOROBEN** applications.•Write Dept. WS-4.

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DALLAS provides for a healthy future with major waterworks expansion

Dallas, Texas, one of the fastest growing cities in the Southwest, is making sure that no water shortage will impede its progress.

Since 1946, Dallas has laid each year better than 100 miles of mains from 4″ to 72″ in diameter. This long-range program has enabled Dallas to provide for all present water needs, despite explosive population growth and a rise in water consumption from 44,000,000 gallons daily in 1946 to 86 million gallons today. It has likewise proved a fortunate factor in meeting the prolonged drought that hit the Southwest.

Today the progressive Dallas Water Department under the direction of its able superintendent, Mr. Henry J. Graeser, is taking a real long look into the future. It is making feasibility studies of new water sources that will continue to support the water needs of Dallas in the year 2000!

If your community expects to keep on growing, now is the time for long-range planning of water main extensions with —

Permanent

CAST IRON PIPE

This is the only pipe that has stood the test of time. Because of its century or more of useful life, its high capacity as a carrier and minimum maintenance cost, Cast Iron Pipe has rightly earned its reputation as: "America's No. 1 Tax Saver."

Our Company does not manufacture Cast Iron Pipe but has long supplied the nation's leading foundries with quality pig iron from which quality pipe is made.

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Since 1882

WOODWARD, ALABAMA

Water *Palatability* achieved by Constant Odor Tests

Concentrations of odor-producing bodies in raw water supplies vary considerably depending upon weather conditions and stream flow.

Water plant operators must make frequent Threshold Odor Tests to check the required dosages of Aqua Nuchar activated carbon necessary to reduce odor concentrations to provide palatable water. These tests are necessary to reveal when more Aqua Nuchar is needed, or when the dosage can be cut back.

Our technical staff will be happy to give your plant a complete odor survey and recommend how and where Aqua Nuchar can help you produce palatable water—no cost or obligation to you.

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division west virginia pulp and paper company

Pure Oil Building
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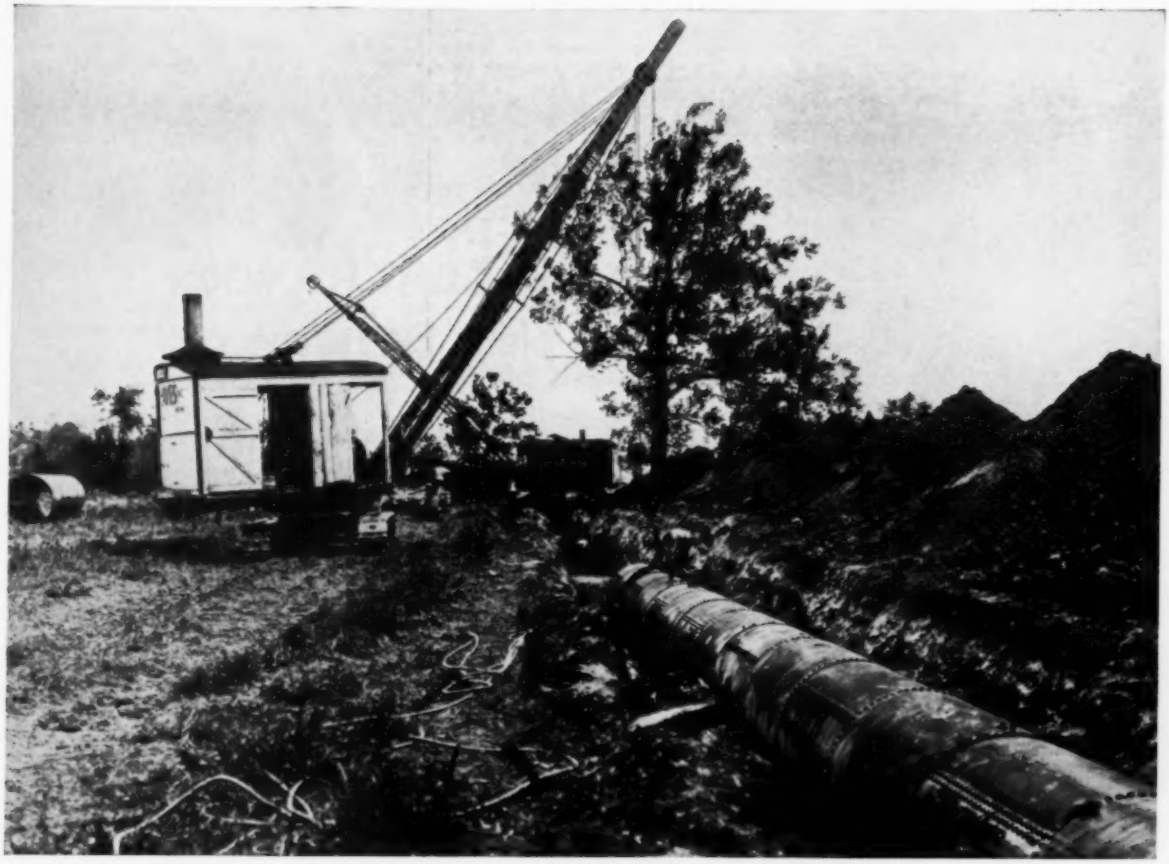
Cleveland 20, Ohio



Installing riveted steel pipe in 1925 near St. Louis' Stacy Park Reservoir.

Big steel mains still going strong in St. Louis

How long will large-diameter steel mains give satisfactory service? Let's look at an example in the city of St. Louis, where many miles of steel pipe have been installed.

Back in the mid-twenties the city developed a badly needed second source of water, at Howard Bend on the Missouri River. The project included installation of a 60-in. ID riveted steel main, nine miles from the filters to a new reservoir at Stacy Park, and eight miles further to the city mains. This line was completed in 1926.

When more transmission capacity was required, the city installed thirteen miles of welded steel pipe, again mostly 60 in. ID. This pipe was coal-tar lined by the spinning method, and coated. It was supplied by Bethlehem Steel in 40-ft lengths, and joined in the field by mechanical couplings. Tests made in 1935 indicated the leakage to be less than a gallon per diameter-inch per mile of pipe in 24 hours.

After more than 30 years of continuous service for much of this pipe, and well over 20 years for the rest, the Water Department reports that it has given uniformly satisfactory service with every indication of continuing to serve well for many years to come.

Laying 40-ft lengths of 60-in.-ID steel pipe in St. Louis in 1934. Note the smooth, shiny coal-tar lining.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Another ACCELAPAK® water treatment plant by INFILCO

AT
FORT MYERS
BEACH, FLORIDA

The ideal plant for small communities, industry, resorts, etc., 15 to 350 g.p.m. featuring...

...low installed cost!
...high quality water!
...minimum operating attention!

"ACCELAPAK" treating plant installation for Fort Myers Beach Waterworks, Inc., Fort Myers Beach, Florida.

Engineering by C. Kenneth S. Dodd, Designing and Consulting Engineer, Sarasota, Florida.

Very compact and efficient, the "ACCELAPAK" plant can easily be incorporated in plans for new installations or adapted for expansion of existing plants. Practically automatic, it requires little attention in operation.

Equipment includes a clarifier or softener, slurry feeder, coagulant feeder, rate-of-flow controller, gravity or pressure filter and other accessories as needed.

SEE YOUR CONSULTING ENGINEER

If you are tolerating inferior water because of obsolete methods or equipment, see your Consulting Engineer. He can give invaluable help in getting the results you want within the budget you can make available. For detailed information about the "ACCELAPAK" plant write today for Bulletin #1870.

Inquiries are also invited on all other water and waste treating problems for municipalities, institutions and industry.

57415-A

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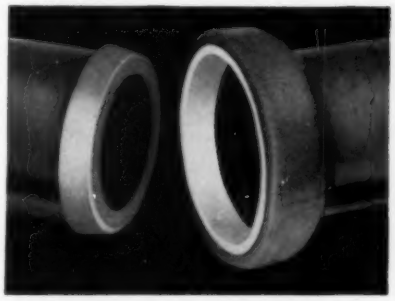
Outstanding Mechanical Joint
on pipe 4 feet long or over
Available in 4" through 24" diameters



More than 200 major installations have been completed with outstanding results since Amvit Jointed Clay Pipe was introduced in 1955.

Such pioneer cities as Ann Arbor, Michigan, Dayton, Ohio, Camden, New Jersey have installed their second and third Amvit sanitary lines.

A mechanical joint designed for quick, low-cost installation, Amvit* will give you lower cost-in-place. Here's how:

1. QUICK INSTALLATION SAVES LABOR

No other materials such as caulking, joint compound, hot pots, or ladles are needed to make the Amvit joint. The joint is on the pipe delivered to the job ready for use. Just push the pipe together and the joint is complete.

2. IMMEDIATE BACKFILLING

You can backfill as soon as the line is completed. Barricades can be removed and streets opened days sooner.

3. QUICK TESTING

No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

4. CONTROLS INFILTRATION

Field tests from completed installations show that infiltration can be definitely controlled. Engineers can, thus, reduce infiltration specifications, use smaller diameter pipe and save in material cost.

5. ROOT PROOF

Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in uniform compression preventing root penetration.

6. BETTER FLOW, LESS MAINTENANCE

The design of the joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing. Because the joint is really tight, no foreign matter such as dirt, sand and stones can possibly enter the line.

7. COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

Amvit Jointed Clay Pipe, in sizes 4" through 24" together with all fittings is available for immediate delivery in the Northeast and Central States.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

*T. M. Registered, Patents Pending

SINCE 1900

AMERICAN

American Vitrified Products Company

CLEVELAND OHIO

MANUFACTURERS OF: Clay Pipe, Flue Liners, Clay Liner Plates and Concrete Pipe.

Plants Across the Nation . . . Brazil, Indiana · Chicago, Illinois · Cleveland, Ohio · Crawfordsville, Indiana · Detroit, Michigan · East Liverpool, Ohio · Fenton, Michigan · Grand Ledge, Michigan · Lisbon, Ohio · Los Angeles, California · Milwaukee, Wisconsin · South Bend, Indiana · Uhrichsville, Ohio

Housewives despair when red water stains mar plumbing fixtures and leave streaks and spots on sheets and linens. And they are loud in their complaints to city officials.

You can turn these complaints into compliments if you adopt Threshold Treatment with Calgon. Calgon stops dissolved iron and manganese from discoloring the water or staining fixtures and fabrics.

Calgon's sequestering and dispersing action stops this precipitation of dissolved iron and manganese—often present in well waters. Red Water is banished, pipe line capacity is retained and the iron or manganese remains *in* the water.

An experienced Calgon engineer will be glad to work with you on the solution of your particular water problem. Write or phone the address below:

CALGON COMPANY

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO

It takes just two steps to assemble the FLUID-TITE Coupling. Lubricate the tapered edge of the gasket. Then slide in the pipe.

Major Advance In Waterworks Industry. K&M's exclusive FLUID-TITE Coupling provides permanent, water-tight, root-tight connections. Allows deflection of up to 5°. Assembled in any weather.

SLIDE IT IN QUICK... IN 2 EASY STEPS

IT'S "K&M" ASBESTOS-CEMENT PRESSURE PIPE WITH EASY-TO-INSTALL FLUID-TITE COUPLING

Installation is fast and economical! It doesn't require skilled labor, heavy machinery, or heavyweight coupling pullers. Install it in any weather.

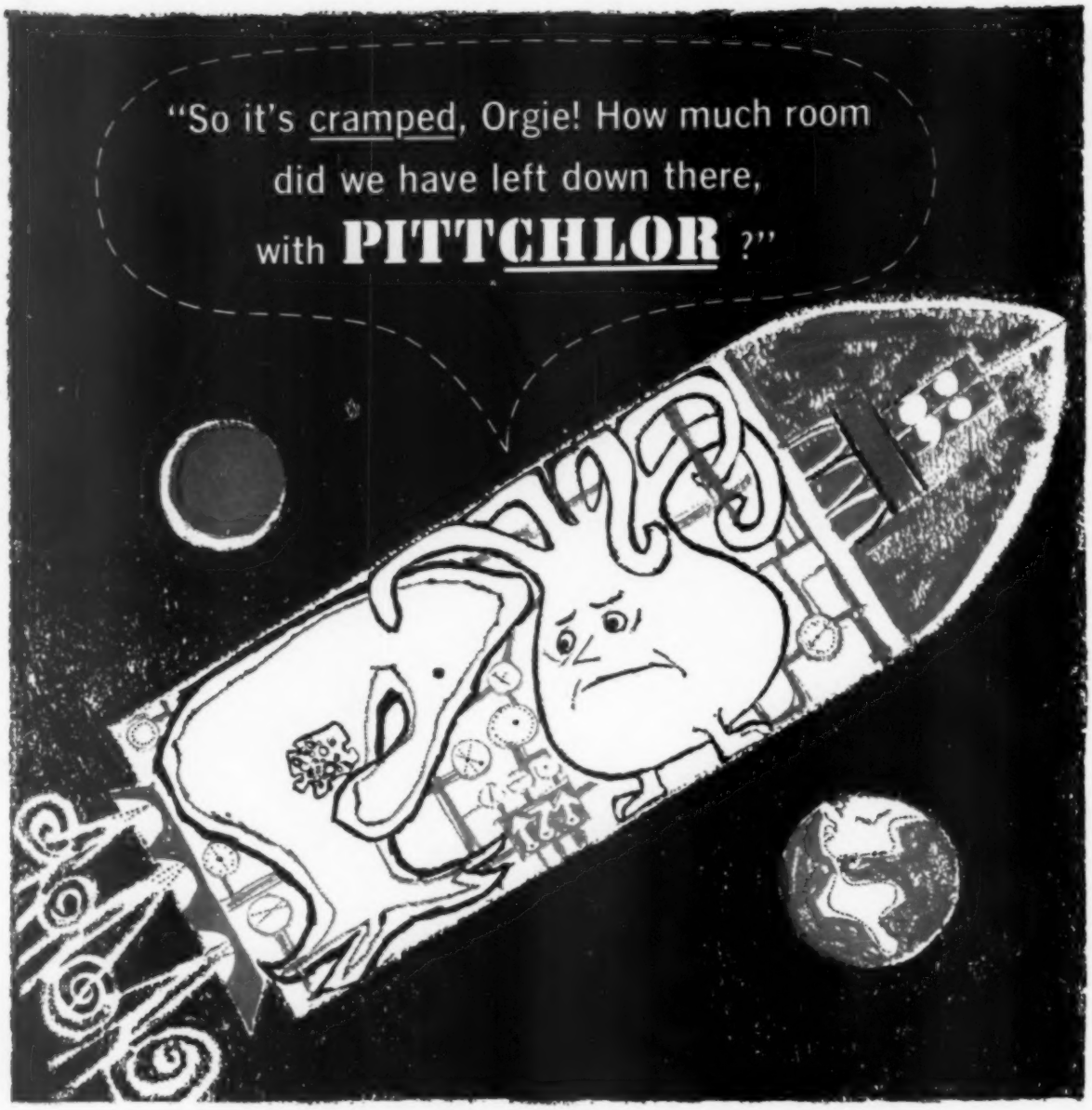
The seal grows tighter as the pressure climbs! Coupling rings expand as water mains fill. Rings have holes on one side for self-energizing action.

It's practically indestructible! "K&M" Asbestos-Cement Pressure Pipe is non-tuberculating, non-electrolytic, and corrosion-resistant. Its first cost is often the last cost. Pressure remains normal—pumping costs stay low.

Visit our booth Nos. 52, 53—AWWA Convention, Dallas Memorial Auditorium, April 20-25.

K·M
BEST IN ASBESTOS

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA



You're a realist, Algie! Pittchlor® closed place after place to you troublesome microorganisms. That water works right on the missile base was just the last straw.

Columbia-Southern's high test calcium hypochlorite answers virtually every water or sewage problem presented by chlorine-susceptible bacteria and algae. Its granular form provides quick release of 70% minimum available chlorine. Pittchlor can be applied without delay or fuss either manually or through mechanical feeding equipment.

This dry, free-flowing, highly stable product gives you economically versatile chlorination . . . "pre," "post," "split" or "super" purification in water supplies, algae control in reservoirs, distributing mains disinfection, filter conditioning, B.O.D. reduction, odor control, effluent disinfection, as an aid in coagulation. Why not contact your nearest Columbia-Southern distributor today?

The Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania. Offices in principal cities. In Canada: Standard Chemical Limited.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
A Subsidiary of Pittsburgh Plate Glass Company

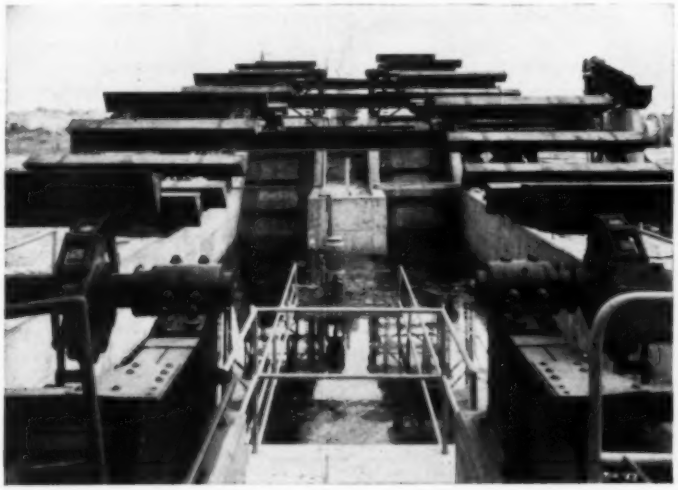
PITTCHLOR—Packaged in resealable cans, 5 lb. (9 per case) and 2½ lb. (6 per case). Also in 100 lb. drums.

Removes tons of sand and bark...

Reclaims 16,000 gallons of water per minute

Traveling Water Screens handle 16,000 gallons per minute at 2 feet per second.

Grit Chamber removes bark, sand, gravel, small pieces of wood, and railroad ballast up to 2" in size.



Sandy soil and brutal service present two water problems at this Southern paper mill. Jeffrey screens take out 6½ tons of bark per hour. Jeffrey grit chambers remove 12 tons of grit as well as other debris deposited during log fluming operations.

Jeffrey engineers analyze waste problems and suggest sound solutions for recovery, disposal or neutralization. They design entire systems or work with your men on selection of equipment.

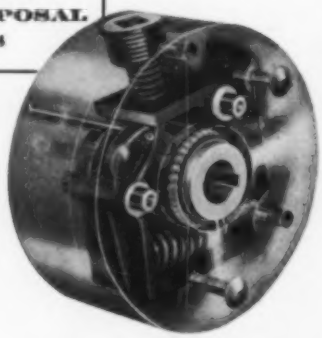
Jeffrey treatment plant equipment includes bar, disc and traveling water screens, grinders, collectors, washers, scum removers, feeders and FLOCTROLS... (controlled flocculation). Jeffrey supplies material handling and power transmission equipment for all or any part of your treatment plant.

The Jeffrey Manufacturing Company, 996 N. Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT... TRANSMISSION MACHINERY... CONTRACT MANUFACTURING

DESIGNED FOR SEWAGE DISPOSAL PLANTS



DOWN-TIME, A MATTER OF MINUTES IN MOTOR DRIVE OVERLOADS

- - - just long enough to locate the overload and to set the drive to running position, when using

CENTRIC TRIG-O-MATIC OVERLOAD *RELEASE* CLUTCHES THAT ELIMINATE TROUBLESOME SHEAR PINS - - -

These clutches are mechanical torque limiting devices that automatically trip out a pre-determined torque value - - - shut off the drive - - - sound an alarm, when overloads occur. It's a protection that can save the heavy costs of prolonged down-time, of replacing broken chains and flight bars.

Resetting the drive to running position is accomplished by a single resetting screw in a matter of minutes - - - returning the overload control to a pre-fixed torque that cannot change regardless of variations in temperature. Possibility of adjustment being tampered with is eliminated.

ELIMINATE SHEAR PINS

Shear pin breakage can extend down-time to hours or days. Eliminate the use of shear pins and avoid the frequent practice of substituting a nail or drill rod for a shear pin - - - items not designed to carry the shear load.

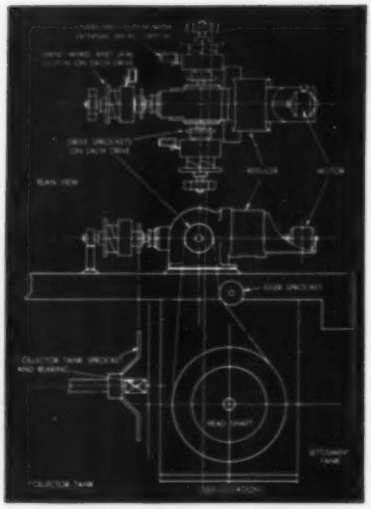
ELIMINATE REDUCER DAMAGE AVOID NEED OF DRAINING TANKS

Trig-O-Matics are installed on the motor reducer drives controlling each tank. Thus a motor reducer drive handling two straight collectors and one cross collector will have Trig-O-Matic on each drive.

There are two styles of arrangement - - - the independent and the non-independent flight bar drives.

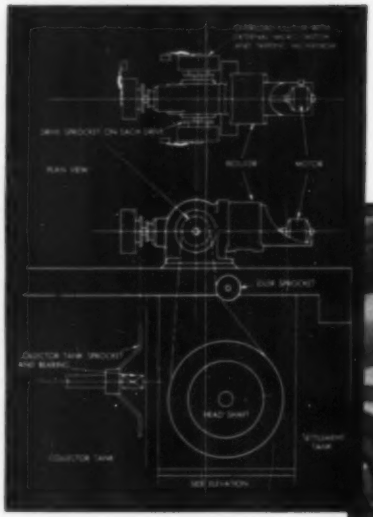
THE INDEPENDENT FLIGHT BAR DRIVE

This is the preferred arrangement. One or two of the three drives can be disconnected and operation can be maintained on the remaining drives, still providing overload protection.



NON-INDEPENDENT FLIGHT BAR DRIVE

This drive can be installed when original drive costs are a factor. Overload protection is individually provided on all drives, but three drives are shut down, when one or more drives are overloaded — however, on this type of drive, external micro-switch tripping mechanism is required.



Send for Bulletin #304, completely describing the principle, operation and applications of the Centric Trig-O-Matic Overload Release Clutch.

A TYPICAL INSTALLATION

Shown is an installation at a large sewage disposal plant, with a single motor drive and three Centric Trig-O-Matic Overload Release Clutches in the independent flight bar arrangement (see top illustration at left.

CENTRIC *Clutch Company*

P. O. BOX 175 • U. S. ROUTE 9 AT MAIN STREET • WOODBRIDGE, N. J.

Improve your safety program with the new Hooker chlorine wall chart

Since chlorine is as safe as the people who handle it, you can help ward off accidents by instructing your employees on safe handling methods.

In concise, easy-to-understand terms, the new Hooker chlorine wall chart lists some precautions to be observed in handling tank cars, cylinders, and ton containers of chlorine.

It tells some of the things to do and, equally important, some of the things not to do, with chlorine.

It contains sections on first aid and emergency methods—advice that can minimize the effects of an accident should it occur.

Mail the coupon for a copy of this chart today. The wall chart supplements in easy-to-post form more complete and detailed engineering and safety information found in the 76-page book, "Hooker Chlorine."

HOOKER ELECTROCHEMICAL COMPANY
1704 UNION ST., NIAGARA FALLS, N. Y.

Please send me a copy of the Chlorine Safety Chart.

Name.....

Title.....

Company.....

Address.....

City..... Zone.....

State.....

HOOKER CHEMICALS PLASTICS

HOOKER ELECTROCHEMICAL COMPANY
1704 UNION STREET, NIAGARA FALLS, N. Y.

Niagara Falls Tacoma Montague, Mich. New York Chicago
Los Angeles Philadelphia Worcester, Mass.
In Canada: Hooker Chemicals Limited, North Vancouver, B. C.

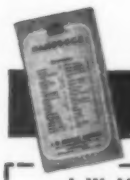
Plastic Coating Stops Costly Condensation Drip and Rust

THE COSTLY PROBLEM caused by dripping from this sweating pipe was permanently solved with one easy and inexpensive application of NoDrip Plastic Coating. Sweating pipes, ceilings, air ducts and other metal equipment are also completely protected against rust and corrosion by low cost NoDrip.

NoDrip Plastic Coating acts immediately to insulate and protect. One application adds many years of service life to metal equipment. NoDrip is also resistant to acid, alkali and brine...protects concrete, brick, plaster, tile wood or composition surfaces.

Easy application requires no special equipment or skill. Anyone can apply NoDrip with brush, trowel or spray. Stop your condensation problem now! Get full details without delay.

JW Mortell COMPANY



FREE

32-PAGE NoDrip DATA HANDBOOK

Complete with photographs, charts and technical information to solve your condensation problem. Write today.

Available at leading plumbing and mill supply houses

J. W. MORTELL CO., 599 Burch St., Kankakee, Ill.

Please send my FREE copy of the NoDrip Data Handbook.

Name_____

Company_____ Title_____

City_____ Zone_____ State_____

Meetings

CONTINUED FROM PAGE 106A

May 15-17—Tucson, Ariz. *(El Conquistador Guest Hotel)*
ARIZONA SECTION, A.W.W.A., and ARIZONA SEWAGE & WATER WORKS ASSN., Joint Meeting, Secy., Stanford I. Roth, 813 E. Jefferson, Phoenix, Ariz.

May 18-24—San Juan, Porto Rico
6TH CONGRESS OF INTER-AMERICAN ASSN. OF SANITARY ENGINEERING, Secy.-Gen., Enrique Ortega, Apartado 218, San Juan 2, P. R.

May 26-27—Catskills, N. Y. *(Grossinger Hotel)*
NEW YORK SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Ralph C. Sweeney, c/o State Dept. of Health, 55 Church St., White Plains, N. Y.

June 2-4—Toronto, Canada *(Royal York Hotel)*
CANADIAN SECTION, A.W.W.A., Secy., A. E. Berry, Ontario Water Resources, Parliament Buildings, Toronto, Ontario, Can.

June 4-5—Gardner, Mass. *(Colonial Hotel)*
NEW ENGLAND SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Earl R. Howard, 115 Broad St., Hartford 5, Conn.

June 4-6—Auburn, Ala. *(Ala. Polytechnic Institute)*
ANNUAL SHORT COURSE SCHOOL AND MEETING ALABAMA WATER & SEWAGE ASSN., Secy., E. J. Finnell, Univ. of Alabama, University, Ala.

June 12—Belfast, Maine
MAINE WATER UTILITIES ASSN., Secy., Gerard F. Laurin, 89 Western Ave., Augusta, Maine

June 12-13—Frederick, Md. *(Francis Scott Key Hotel)*
MARYLAND-DELAWARE WATER & SEWAGE ASSN., Secy., W. M. Bingley, 2411 N. Charles St., Baltimore 18, Md.

June 18—Swampscott, Mass. *(New Ocean House)*
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, 73 Tremont Street, Boston 8, Mass.

June 18-20—Toledo, Ohio *(Commodore Perry Hotel)*
OHIO SEWAGE & INDUSTRIAL WASTES TREATMENT CONFERENCE, Secy., Cleamon E. Lay, 301 Ohio Departments Bldg., Columbus 15, Ohio

June 18-20—Council Bluffs, Iowa *(Hotel Chieftain)*
IOWA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., L. F. Skorczeski, 207 South 15th Ave., Marshalltown, Iowa

June 22-25—Philadelphia, Pa. *(Bellevue-Stratford Hotel)*
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, 50th Anniversary Meeting, Secy., F. J. Van Antwerpen, 25 W. 45th St., New York 36, N. Y.

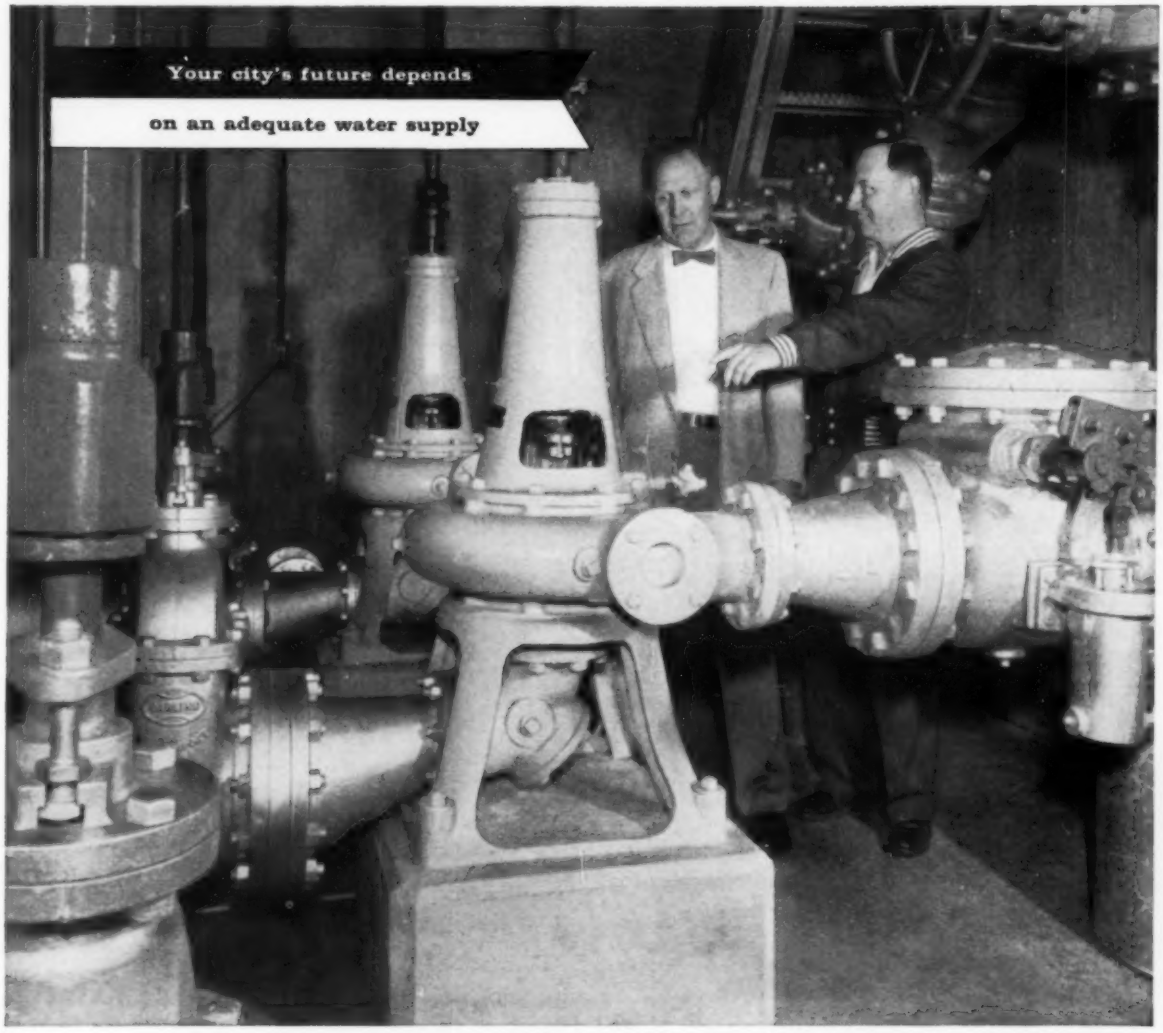
June 23-25—Charlevoix, Mich. *(Charlevoix Beach Hotel)*
MICHIGAN SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Donald M. Pierce, Michigan Dept. of Health, Lansing 4, Mich.

June 23-27—Portland, Oregon *(Hotel Multnomah)*
AMERICAN SOCIETY OF CIVIL ENGINEERS, Exec. Secy., W. H. Wisely, 33 W. 39th St., New York 18, N. Y.

June 25-27—Erie, Pa. *(Hotel Lawrence)*
PENNSYLVANIA SECTION, A.W.W.A., Secy., L. S. Morgan, Div. Engr. State Dept. of Health, Greensburg, Pa.

Aug. 11-13—University Park *(Pa. University)*
PENNSYLVANIA WATER WORKS OPERATORS' ASSN., Secy., Harry A. DeWire, 29 Chestnut St., Lewistown, Pa.

Aug. 13-15—University Park, Pa. *(Pa. University)*
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., J. R. Harvey, 916 Diamond, Meadville, Pa.



Mr. George W. Welsh, Jr. (left), Deputy Chief of Bureau of Operations for Baltimore County, and Asst. Superintendent of Pumping Division Louis A. Hauptman inspect Fairbanks-Morse non-clog pumps in Stella Maris Pumping Station.

Baltimore County gets ready for growth

Forecasting a population of 700,000 by 1975, Baltimore County, Maryland, is not to be caught short for sewage-handling facilities. Since 1948 this foresighted community has spent an average $5,000,000 a year for expansion of facilities—and plans to have over 70 pumping stations by the end of this year.

Over two-thirds of the pumps in the system are Fairbanks-Morse, driven by F-M motors. Typical of F-M ability to meet exact requirements are the installations of F-M bladeless-impeller pumps, designed for non-clog, trouble-free operation.

Like so many communities today, Baltimore County finds exclusive advantages in working with Fairbanks-Morse—because the big, broad F-M line provides the ideal combination: the right type, right size pumps driven by the right type, right size diesel engines or electric motors—all built by F-M, all backed by undivided F-M responsibility. Why not investigate what F-M unmatched experience and facilities can do for you? Write today to Fairbanks, Morse & Co., Dept. WSW-4, 600 So. Michigan Ave., Chicago 5, Illinois.

Ask for F-M Bulletin 5410K on Non-Clog Pumps.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MAGNETOS

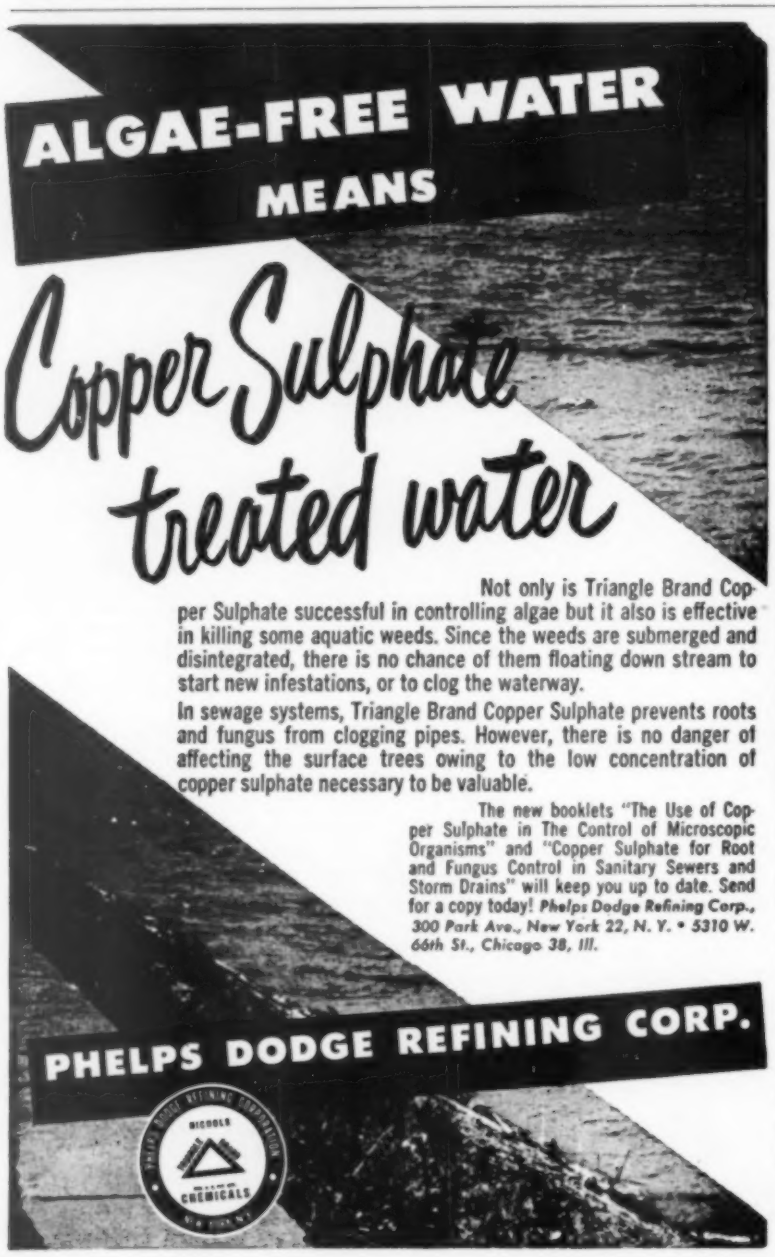
News of Suppliers

Flanders Appointed Gen. Mgr. of Gamon Meter

Worthington Corp., Harrison, N. J., has announced that William C. Flanders has been appointed General Manager of Gamon Meter Div. in Newark.

Mr. Flanders joined the Gamon Meter Company in 1925. For the past twenty years he has been General Sales Manager at Gamon and since 1951 has also served as Assistant General Manager of the Division.

Andrew K. Richardson succeeds Mr. Flanders as Sales Manager. Mr. Richardson, a graduate engineer, was originally employed by the City of Helena, Montana as Assistant City Engineer and then City Engineer. He joined Gamon Meter in 1946 and has, until now, been Regional Sales Manager in the Chicago area.


ALGAE-FREE WATER
MEANS
Copper Sulphate
treated water
Not only is Triangle Brand Copper Sulphate successful in controlling algae but it also is effective in killing some aquatic weeds. Since the weeds are submerged and disintegrated, there is no chance of them floating down stream to start new infestations, or to clog the waterway.
In sewage systems, Triangle Brand Copper Sulphate prevents roots and fungus from clogging pipes. However, there is no danger of affecting the surface trees owing to the low concentration of copper sulphate necessary to be valuable.
The new booklets "The Use of Copper Sulphate in The Control of Microscopic Organisms" and "Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains" will keep you up to date. Send for a copy today! Phelps Dodge Refining Corp., 300 Park Ave., New York 22, N. Y. • 5310 W. 66th St., Chicago 38, Ill.
PHELPS DODGE REFINING CORP.
CHEMICALS

Osgood Co. Appoints Sales Reps. for Flomatcher Controls

The George M. Osgood Co., Portland, Oregon has appointed a nationwide force of territorial sales representatives for the FLOmatcher pump discharge control. The FLOmatcher is manufactured for use in sewage and waste disposal pumping plants by the General Services Co., Corvallis, Ore.

Sales representatives appointed are: Engineers Sales & Service, Inc., Los Angeles, Calif.; Waterworks Equipment Co., Salt Lake City, Utah, Pocatello, Ida. and Boise, Ida.; H. G. Goble Co., Denver, Colo.; Bert Gurney & Associates, Omaha, Neb.; Kirk Campbell Co., Kansas City, Mo.; Del Equipment Co., Chicago, Ill.; Robert F. McGivern & Associates, Columbus, Ohio; Dubois-Cooper Associates, Detroit, Mich.; Arthur W. Schuster Co., Rochester, N. Y.; C. F. Goodwin Co., New York, N. Y.; Hosmer Kimball Co., Boston, Mass.; C. A. Briggs Associates, Glenside, Penna.; Jos. W. Eshelman Co.; Charlotte, N. C. and Birmingham, Ala.; and Ellis K. Phelps, Orlando, Fla.

Kim Blanchard Joins Neptune Meter

Neptune Meter Co., New York, N. Y., has announced that Kimball "Kim" Blanchard, secretary-treasurer of the N. Y. Section of the A.W.W.A., has joined the sales staff.

Prior to joining Neptune, Mr. Blanchard was associated with the Ludlow Valve Co.; he was Sales Manager of the New York Branch of Rensselaer Valve, which firm was acquired by Ludlow in 1955.

Kim Blanchard's business pursuit is following a parallel pattern to that set by his father, Rollo K. Blanchard —a prominent and active member of the Water Works Industry until his death in 1953. The senior Mr. Blanchard had acquired his early training and experience in the valve and pump field and transferred to Neptune Meter Company in 1912 where he advanced to the position of Vice President. He too was an officer in the N. Y. Section of the A.W.W.A.

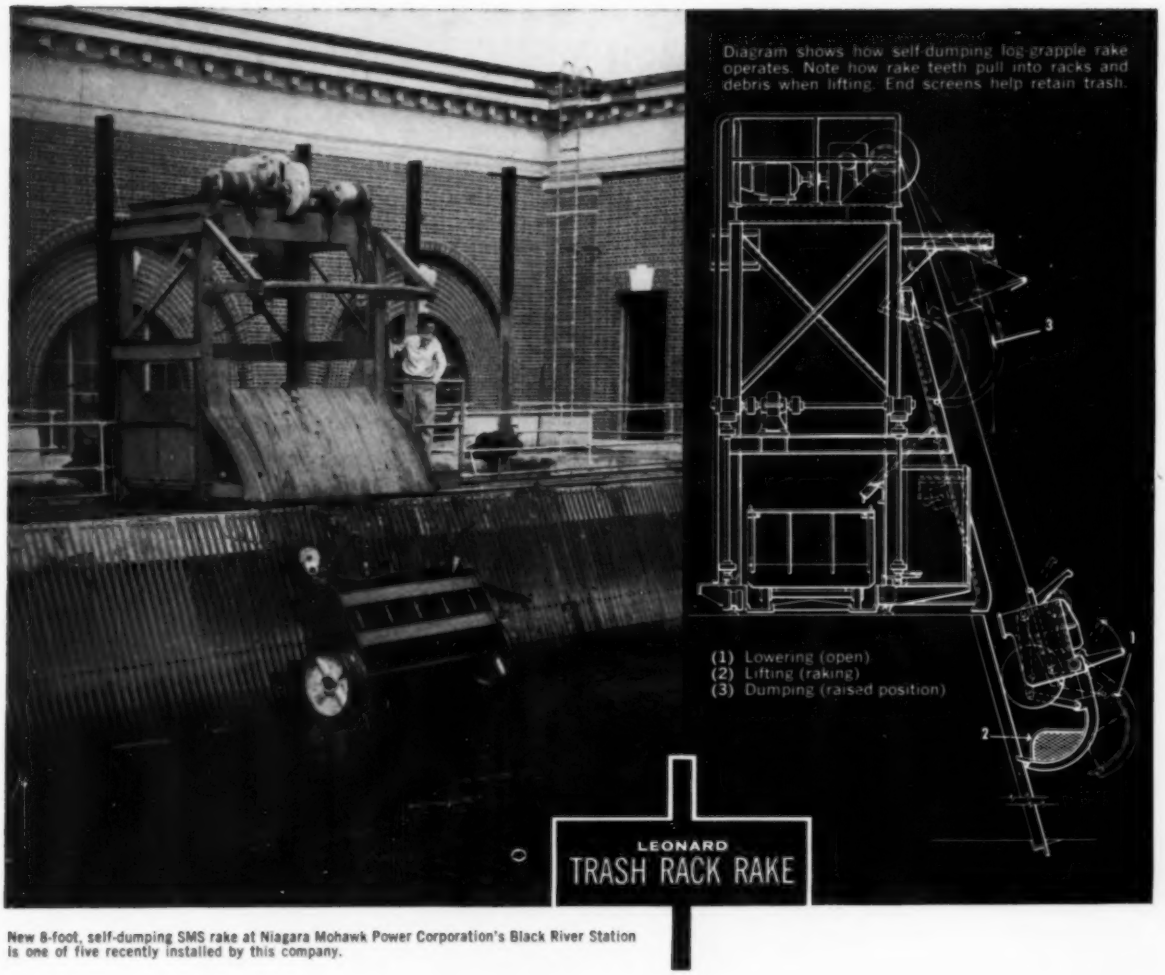


Diagram shows how self-dumping log-grapple rake operates. Note how rake teeth pull into racks and debris when lifting. End screens help retain trash.
(1) Lowering (open)
(2) Lifting (raking)
(3) Dumping (raised position)
1
2
3
LEONARD
TRASH RACK RAKE

New 8-foot, self-dumping SMS rake at Niagara Mohawk Power Corporation's Black River Station is one of five recently installed by this company.

Two New Self-Dumping SMS Trash Rake Designs CUT CLEANING TIME AND LABOR

Now SMS offers you two improved Leonard trash rack rakes, both regular and log-grapple types. These self-dumping rake designs make operation easier and quicker, permit you to clean a greater area faster. Both new rake types are now available as additions to the SMS line of standard rake designs.

SMS Leonard rakes operate directly on trash rack bars . . . ride down over stubborn obstructions and work them loose. Such freedom of movement assures fast, easy cleaning. Initial costs are low because the width of SMS rakes can be kept to the minimum required for handling for trash and the expense of guides attached to racks, or embedded in piers is eliminated. These rakes are of simple and rugged construction, designed for outdoor service and require minimum maintenance.

For full information on trash rakes and other SMS accessories, write to S. Morgan Smith Co., York, Penna. Request Bulletin 158 on Leonard rakes, or Bulletin 158A on new, self-dumping rakes.

S. MORGAN SMITH SMS **HYDRODYNAMICS**

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

Rotovalves • Ball Valves • R-S Butterfly Valves • Free-Discharge Valves • Liquid Heaters • Pumps • Hydraulic Turbines & Accessories

News of Suppliers

Gamon Meter Promotes Saylors

Worthington Corp., Harrison, N. J., has announced that Roy A. Saylors has been appointed District Manager of the Chicago territory for the Gamon Meter Division. Mr. Saylors replaces Andrew K. Richardson who was recently named General Sales Manager for Gamon Meter at the division's general office in Newark, N. J.

Mr. Saylors served as Assistant Construction Superintendent at the City of Lincoln, Nebraska before joining the Gamon Meter Division in the Denver, Colorado area in 1952.

outstanding reliability is normal routine with a

FLOmatcher

sewage pumping system

Six years of problem-free service in over 25 installations have proved the FLOmatcher liquid rheostat system the economical solution to variable flow pumping problems. Because it has almost no moving parts, a year and a half of steady 24-hour operation without maintenance is routine for FLOmatcher. All parts that contact liquids are of proven corrosion resistant materials, insuring 25 years or more of life. In addition, operating costs are reduced with FLOmatcher. Static head and friction head are decreased and wear is minimized through lower average pump speeds and liquid velocity

only gravity moves sewage as reliably as a **FLOmatcher**

Pumping station, sewage treatment plant, Corvallis, Oregon

a product of
GENERAL SERVICES CO.
CORVALLIS, OREGON

For Full Details on the FLOmatcher Pump Control System, use Reader Service Card or contact:

GEORGE M. OSGOOD CO.
NATIONAL SALES REPRESENTATIVE
Builder's Exchange Bldg., Portland, Oregon • CA 2-1953

Ludlow Valve Elects Ackerman President

Ludlow Valve Mfg. Co., Inc., Troy, N. Y., has announced that David D. Ackerman was elected president and a director of the Ludlow Valve Mfg. Co., Inc., Troy, N. Y., and its Canadian Subsidiary, Canadian Ludlow Valve Mfg. Co., Ltd. He succeeds Earl W. Pughe, retired.

Mr. Ackerman joined Ludlow's New York City sales office in 1947 and became plant personnel director shortly after the company purchased the Rensselaer Valve Co. in 1955. He was made assistant to the president in January, 1947, and elected vice president and general manager in July, 1957.

McGuiness Joins Proportioneers

Proportioneers, Ind., Div. of B-I-F Industries, Providence, R. I., has announced that Daniel L. McGuiness, Jr., as Development Coordinator, responsible for overseeing all development activities of this division.

Mr. McGuiness, previous to his last position as Engineering Products Manager for Standard Coil Products Co., Inc., served Corning Glass Works, Corning, N. Y., in an engineering capacity. He holds a B.S. degree in Electrical Engineering from MIT and a MBA degree in Industrial Management from Boston University.

Graver Water Now Division of Union Tank

Graver Water Conditioning Co., New York, N. Y., has announced that it is now a completely integrated and wholly owned division of Union Tank Car Company, Chicago.

According to the company, the main offices of the division will remain at their present location in New York City. There will be no basic change in the division's former policy or methods of operation. The new affiliation will make available broader financial and managerial resources and permit increased emphasis on creative engineering, research and development.

On Criticism

It is well to wink at small faults. Remember thou hast greater ones.—*Poor Richard*

We're on target . . .

about to zero in on

DALLAS

and the AWWA Convention

See you in Booths 154 and 155

R. D. WOOD COMPANY

Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (centrifugally cast in sand molds)

* We particularly want you to see our "babies"—scale model portable hydrants. We will have them on view at the Convention.

Equipment News

CONTINUED FROM PAGE 25A

Repair Clamp

418

Dresser Mfg. Div., Dresser Industries, Bradford, Pa., has announced that efficient, quick, economical water and sewage line maintenance is now possible with the new Dresser "360" all-around Repair Clamp.

Made of 20-gauge stainless steel and Grade A malleable iron, this clamp provides an easier-to-install, more efficient method of repairing full breaks or holes in asbestos-cement and cast iron water lines.

The manufacturer cites easy installation—simply remove the bolts from one side of the clamp, spring the clamp around the pipe, insert the bolts and tighten the nuts.

The exclusive sliding lug design eliminates all weak or loose parts, assuring a positive, leakproof seal every time. Bolt pull is transmitted effectively into pressure, preventing pivoting action or bolt bending. The lug also permits a range of adjustability sufficient to compensate for variations in asbestos-cement and cast iron pipe diameters. As an added precaution the lugs are plastic dipped.

The steel track head bolts have rolled threads for greater strength.

Soluble Phosphate for Scale, Rust and Corrosion Protection

419

Calgon Co., Pittsburgh, Pa., has developed Instantreat, a rapidly soluble complex phosphate that affords low cost protection against lime scale, corrosion and rusty iron water.

The new product was developed specially for use with solution feeding equipment in small industrial and other water systems.

When used with the Calgon Chemical Feed Pump, this patented phosphate provides a sterile feed solution entirely safe for use in drinking water systems. It requires only two minutes to prepare a high purity feed solution with Instantreat.

The company claims the new pump, when used with Instantreat, will provide continuous automatic treatment for systems with flow requirements up to 10,000 gallons per hour.

Tamper Attachment for Power Crane

420

Schield Bantam Co., Waverly, Ia., has announced the availability of a specially designed tamper attachment for its complete line of power cranes-excavators.

One of the outstanding features of the new Bantam tamper is the fact that it offers 80%-100% compaction at a maximum penetration of three feet. With the tamper method, only three full-lead passes at a given point in average ground will bring full compaction and virtually assure meeting compaction specifications. Compared to maximum lifts of 6" with conventional tamping methods, the time and labor-saving advantages of the new tamper become apparent.

The new tamper is quickly inter-

CONTINUED ON PAGE 130A

WACO

T.M. REG. CANADA

ALUMINUM WALKWAYS ARE SAFE, MAINTENANCE-FREE

Non-Corrosive, Strong and Durable—They are Valuable Assets in Water and Sewage Plants

George H. Hill, Washington Aluminum's New England representative, points out the grating's patented perforation pattern.

Washington Aluminum Walkways *provide* a lifetime of maintenance-free service—never need painting, resist rust and corrosion, provide ventilation. Their strength lies in the I-beam extrusion.

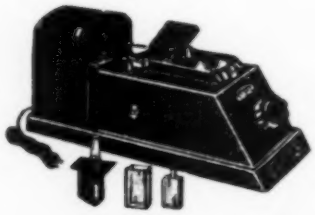
Washington Aluminum fabricates grating and other installations to specification. Consult our Engineers at point of planning. . . . No charge — no obligation! . . . an engineering service of Washington Aluminum Company, Inc.

WASHINGTON ALUMINUM COMPANY, Inc.

Dept. 74 • Baltimore 29, Md. • Phone Circle 2-1000

KLETT SUMMERSON ELECTRIC PHOTOMETER

Adaptable for Use in Water Analysis

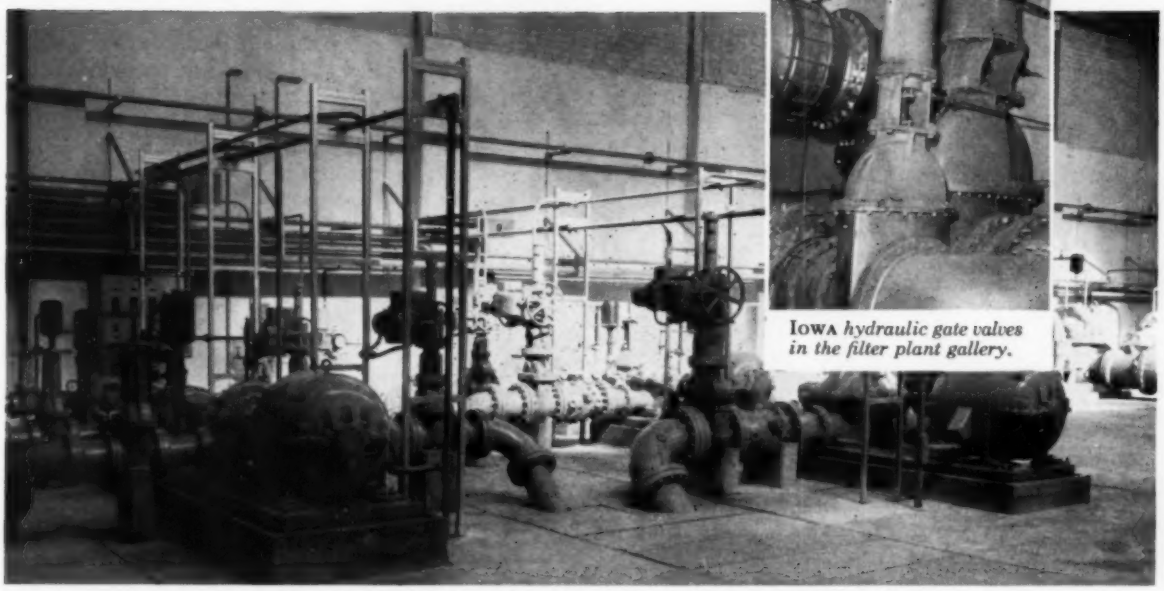


Can be used for any determination in which color turbidity can be developed in proportion to substance to be determined.

KLETT MANUFACTURING CO.

179 EAST 87th STREET • NEW YORK 28, N. Y.

40 IOWA GATE VALVES...



IOWA *hydraulic gate valves in the filter plant gallery.*

IOWA *motor-operated gate valves installed in the main pump station of North Texas Municipal Water District. (General Manager: Mr. A. P. Rollins; Consulting Engineers: Forrest and Cotton; Design Engineer: Mr. Ormond A. Stone.)*

Control delivery of
20 million gallons of water a day
for the North Texas Municipal Water District

• Forty IOWA Hydraulic and Motor-operated Gate Valves—from 4" to 30" sizes—are used in the Filter Gallery and High Lift Pump Station of the North Texas Municipal Water District, supplying 10 North Texas Municipalities and the District's largest customer, the City of Dallas. Additional IOWA gate valves are used in the six pumping plants operated by the district.

The Filter Plant, located at Wylie, Texas, has a capacity of 20 million gallons a day. However, the design is such that it can operate safely at twice this amount. Water is delivered to the ten member municipalities and the City of Dallas through 90 miles of transmission line, ranging from 12 to 42 inches in diameter.

This Texas application is typical of the ability of IOWA to furnish gate valves to meet the most exacting specifications for plant and distribution service. Be sure and check the wide variety of IOWA valves, accessories and specialties before you place your order.

Let us send you details on Iowa's complete line of valves and hydrants

IOWA
VALVE COMPANY
A Subsidiary of James B. Clow & Sons, Inc.
Oskaloosa, Iowa

Equipment News

CONTINUED FROM PAGE 128A

changeable with any of Bantam's other nine attachments on all three equipment models. Power boom hoist and precision control allow the operator to control drops from 1′ to 10′ for safe, sure operation.

Ditcher Digs to 56-In. Depth

421

Barber-Greene, Aurora, Ill., has an improved Model 705-B "Runabout" Ditcher, that features a maximum digging depth of 56 inches.

This represents an increase of 8 inches in maximum digging depth over the former 48 inch maximum. The new longer boom will also cut the full range of widths, 5½ inches, 7½ inches and 10½ inches, which the "Runabout" has featured since its introduction.

The "Runabout" with the new, longer boom, also features Barber-Greene's exclusive all-hydraulic infinitely variable, crowding speed control, "Hydracrowd"; a 15 mph road speed, an optional hydraulically driven discharge conveyor, a comfortable all-weather operator's cab, a fluid coupling between power unit and drive mechanism and a special differential which aids traction on mud or ice by feeding power to whichever drive wheel may be on firmer footing than the other.

Chemical Opens Clogged Sewer Lines

422

National Disinfectant Co., Dallas, Texas has developed ND-25 a chemical compound that is poured into sewer manholes to avoid sewer stoppage.

ND-25 in a sewer line becomes activated by moisture, creating considerable heat and agitation, thus removing debris or sediment. It will saponify and emulsify greases and oils and will digest roots, paper and other material in the sewer lines. The compound comes in 50 and 400 lbs. container.

sion of Sanitation and with the Kansas City, Missouri Water Department as senior civil engineer.

Pressure Pipe

423

W. R. Ames Co., Milpitas, Calif., has developed a new kind of industrial pipe called APL (Ames Positive-Lock). Available in 2", 3", and 4" stock diameters, and 20, 30, or 40 ft stock lengths, weighing as little as 36 lb per 100 running feet, the pipe is mechanically coupled on the spot in the field, and provides a 100% air-tight and watertight immediate seal able to transmit pressures up to 1500 psi on either liquids or semi-solids with neither threaded connections, sealing compounds, or back-breaking muscles used to put it together.

A complete selection of valves, tees, elbows, reducers, and other fittings is available to satisfy every operating requirement—even including the adaptation of APL equipment to existing pipe systems.

The APL coupler is a specially formed short section of aluminum or steel pipe, containing the locking device and the long-life Neoprene tri-ring that assures the positive pressure seal with as little as two pounds of pressure in the line.

CONTINUED ON PAGE 132A

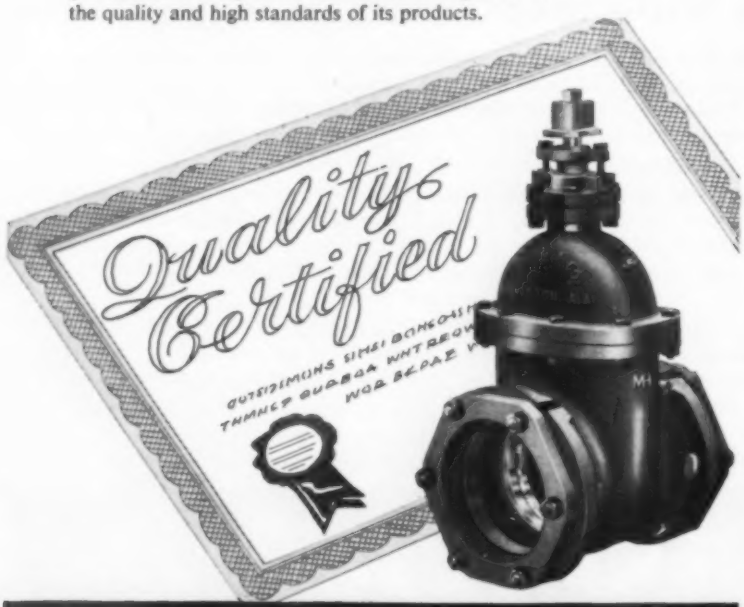
"WE CERTIFY"

M & H welcomes the suggestion of the American Water Works Association to certify the quality of products made to conform to current AWWA specifications. This is a matter of importance to the water works industry. For the present, the procedure is not completely resolved; nevertheless the program as such will reflect a valuable contribution to users of water works materials.

All M & H products listed as AWWA standard (either valves or hydrants) are made in strict compliance with latest AWWA specifications.

M & H products have been developed through many years of research in engineering, design, foundry practice and water works operation. This Company's greatest asset today is the confidence of engineers in the quality and high standards of its products.

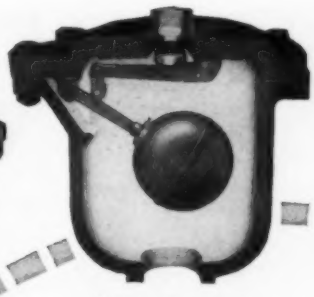
MH



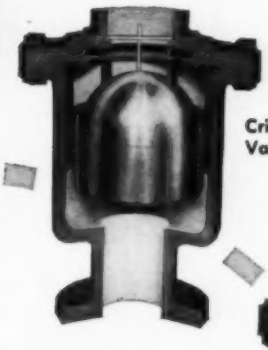
M&H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

SUBSIDIARY OF WALWORTH

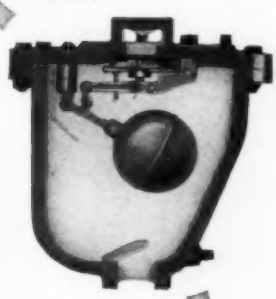
Crispin Midget Valves



Crispin Pressure Valves



Crispin Air & Vacuum Valves



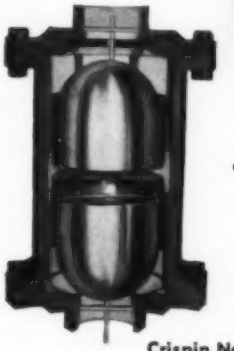
Crispin Universal Valves

For positive air control...

Crispin

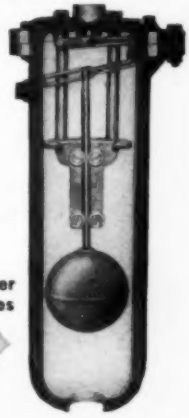
AUTOMATIC AIR VALVES

...preferred by works engineers for over 45 years

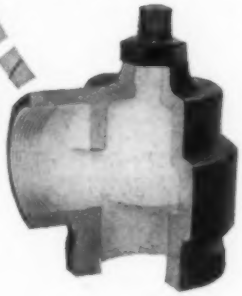


Crispin Negative Pressure Valves

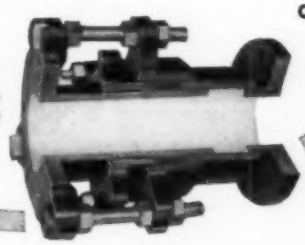
Crispin Air Valves safely control air in lines handling liquids to maintain efficient operations—prevent expensive failures. Simplified construction, easy accessibility, maximum durability, minimum maintenance and efficient operation are five solid reasons why Crispin Air Valves are completely dependable.



Crispin Sewer Valves



Crispin Deep Well Valves



Crispin Slip Joint

Write today **for this new Crispin Air Valve Catalog...**

AIR CONTROL VALVES FOR OVER 45 YEARS

multiplex

MANUFACTURING COMPANY
BERWICK, PENNSYLVANIA

MULTIPLEX MANUFACTURING COMPANY
DEPT. AB, BERWICK, PENNSYLVANIA

Name_____

Company_____

Address_____

City_____ State_____

Title_____

One Bright $ Sign in the Water Line

Most operations in the water processing line cost money . . . with little or no opportunity to make them pay for themselves.

One bright spot in the line is the water meter, which measures and determines the income. And when the meter is well set it can earn more by being well protected but still easily available for reading and changing.

Many water utilities are realizing thousands of dollars annually in labor savings and in increased revenues from well-set and well-maintained meters.

Perhaps you, too, can show bigger net profits this inexpensive way.

Send for
Ford Catalog No. 56.

THE FORD METER BOX COMPANY, INC.
Wabash, Indiana

FOR BETTER WATER SERVICES **FORD**

PAYNE DEAN VALVE OPERATOR

MAKES *EVERY* VALVE *POWER OPERATED*

PAYNE DEAN & CO. CLINTON, CONN.

Equipment News

CONTINUED FROM PAGE 130A

Gaslifter Digestor Circulator-Mixer

424

Walker Process Equipment, Inc., Aurora, Ill., has announced that actual plant tests in recent months indicate that the "Gaslifter" will prove to be the most efficient digester circulator-mixer available. Not only is the usual grease and scum blanket nuisance eliminated, but digestion of incoming "green" sludge is accelerated by the thorough circulation of the digester contents.

Reports of increased gas production show that more rapid sludge digestion takes place thereby permitting maximum loading of the digester. "Gaslifters" utilize the "airlift" principle and operate on compressed (4½ psig) digester gas. They are not subject to mechanical difficulties or fouling.

Electronic Recorder

423

Hagan Chemicals & Controls, Inc., Pittsburgh, Pa., has developed a new electronic recorder that can receive

and record output from as many as four remote ring balance meter-operated slide wires.

The instrument can be used to record any quantity measured by a Hagan Ring Balance Meter, including

CONTINUED ON PAGE 134A

NEW SIMPLEX ELECTRO-PNEUMATIC SYSTEM PROGRAMS FILTER WASHING AUTOMATICALLY

Fully-interlocked System Regulates Flow; Shuts Down, Washes, Rinses, and Reopens Filters

Now simplicity, efficiency and manpower savings come to filter plants with the new Simplex Automated Filter Operating Table.

From one central point, filtering and washing cycles can be initiated automatically . . . all rates and times maintained accurately. Valve action is completely pneumatic! The system contains no electrical devices that might malfunction in the dampness of a wet pipe gallery.

Shut-off and Cut-off

This new system automatically shuts off a filter if the clearwell is filled—returns it to service when needed. Depending on the control you prefer, a filter will be automatically removed from service for backwashing when (1) loss of head reaches cut-off point you pre-set (usually 8') or (2) electric timer has run through the value you pre-set (80 to 120 hrs.). At any point, the operator can manually over-ride these automatic controls.

No-Flood Washing

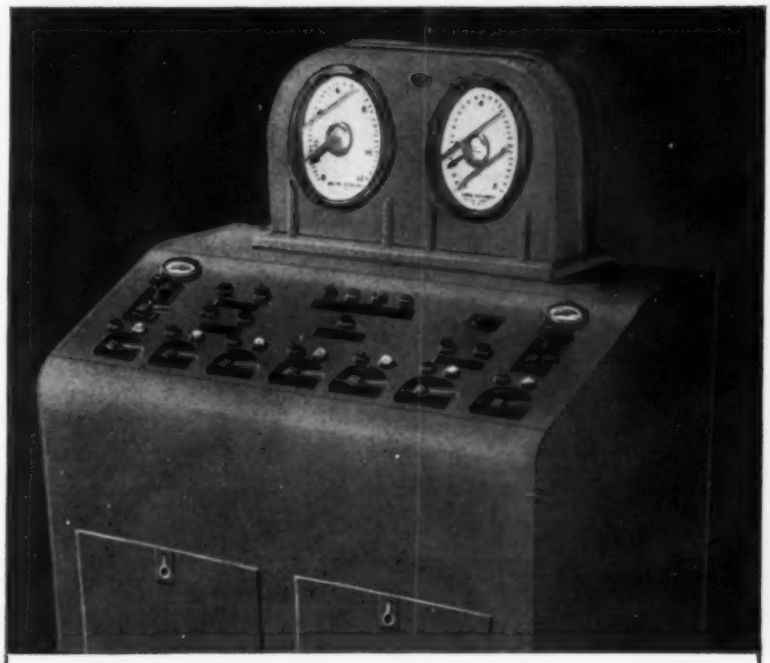
When automatic program starts, the filter Influent Valve is closed, water level drops to wash-trough lips, then the filter Effluent Valve is closed.

Next the Drain Valve is opened, followed by the Wash-Water Valve. Pneumatic interlocks prevent flooding: wash valve can't open until drain valve is fully open.

Washing is precisely timed at slow-fast-slow rates . . . so bed is cleaned and hydraulically graded for clean starts and optimum results.

Saves Treated Water

To prevent flooding, Drain Valve can't close until all Wash Valves have first closed. To prevent waste of treated water, filter Influent Valve can't open until drain valve has completely closed. Washing period can be extended, if desired.



NEW SIMPLEX AUTOMATED FILTER TABLE: Large dials indicate and/or record rate of flow and loss of head. Smaller dials set filtration and wash rates. Colored lights show progress of the automatic cycle. Manual levers permit operator to over-ride the automatic programming at any point.

Controlled Starts

To prevent turbid starts, when the Influent Valve is opened, the Effluent Valve stays closed until water reaches operating level. Float switch then opens Effluent Valve.

No Sequence Errors

Cascade programming makes mistakes impossible. All valves open and close in their proper sequence.

Automated Filter Plants

Obviously the control functions built into this new Simplex Table can also be used to control a series of filters. We'll gladly discuss your plans for integrated sequential control that interlinks all filters for fully automatic operation of an entire filter plant.

Your Plans

We'll gladly rush further details or a Bulletin to help you evaluate this important Simplex development. Write Simplex Valve & Meter Company, Dept. WS-4, 7 E. Orange Street, Lancaster, Pa.

SIMPLEX®

VALVE AND METER COMPANY

"MN" • The New Simplicity
• New Economy
• New Maintenance Low

— in Measuring Flow Through Open Flow Nozzles

The BURGESS-MANNING Type "MN" Meter

eliminates:

Stilling well and cover
Connecting pressure piping and fittings
Cleaning valves
Sediment traps
Back flushing requirements
Float cable
Clear water for flushing
Space and concrete work needed for above

Here is a distinct advance in the art of measuring flow of liquid under gravity conditions. Here is accurate measurement of flow at all times. Here is a method of measurement that is free of troublesome and highly objectionable maintenance.

Think of the savings! Think of the elimination of maintenance!

Write for Burgess-Manning "MN" Meter Bulletin

BURGESS-MANNING COMPANY
Penn Instruments Division
4132 Haverford Ave., Philadelphia 4, Pennsylvania

The Simple, Inexpensive, Rugged, Dependable means of Lifting Sewage

KOMLINE-SANDERSON
Pneumatic
Sewage Ejectors

Illustrated: Cast iron duplex 250 GPM system.
K-S Ejectors are available in cast iron or welded steel in single or duplex design.

The Komline-Sanderson Ejector:

Eliminates complex and intricate piping.
Provides economical operating features.
Offers electric or entirely pneumatic control system.

Write for catalog giving layout dimensions, piping diagrams and helpful information in the design of pneumatic ejector stations.
Bulletin No. KSM-2 available on request.

MECHANICAL EQUIPMENT DIVISION

KOMLINE-SANDERSON ENGINEERING CORPORATION
102 Holland Avenue, Peapack, New Jersey

Equipment News

CONTINUED FROM PAGE 132A

fluid density, liquid level in open or closed vessels, boiler drum water levels, and temperature and pressure compensated fluid flow readings.

Heart of the Ring Balance Electronic Recorder is a newly designed electronic receiver, a compact unit housing an amplifier, input box, servomotor and slide wire. As many as four receivers can be installed in a single recorder.

Various accessory combinations, including a pneumatic transmitter for control system signals, slide wire output for logging systems, alarm contacts and computing devices, can be used with the receiver.

Dial Type Indicating Potentiometers

426

The Bristol Co., Waterbury, Conn., has developed a new indicating version of the Dynamaster self-balancing electronic potentiometer or bridge.

This new indicator is designed for use when legibility of the indicated scale from greater distances is an important factor. This instrument has the same 32-inch long scale and the same pointer as the standard case. There is no recording mechanism, however, and the instrument indicates only.

The instrument is also offered in electric control models, in on-off, two-position, three-position, floating, proportional, and current-input types of control.

The new instrument can be used for measurements of such variables as temperature, speed, pressure, smoke density, pH and electrical values.

On Discretion

He that would live in peace and ease had best not speak all that he may know; neither judge all he may see.—*Poor Richard*

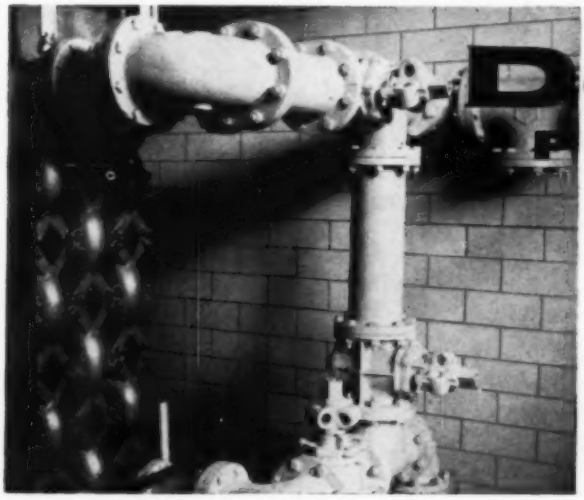
You get eccentric action

..you get resilient plugs

..you get tight shut-off

..you get easy operation

.....when you get



DeZurik
PLUG VALVES

You get *all* these advantages . . . and more . . . with DeZurik Valves, because DeZurik — *and only DeZurik* — features the eccentric principle, providing easy operation and dead-tight shut-off WITHOUT LUBRICATION!

There are other advantages, too. For instance, DeZurik Valves have nickel seats that last and last; and with their single-faced plug, liquid is not "trapped" in the valve body to freeze or ferment.

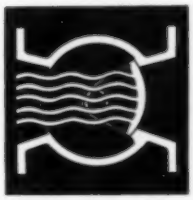
DeZurik Valves are available in a wide range of models and in sizes from ½" thru 20" with manual or a complete range of remote operators.

ECCENTRIC ACTION

Pivoting eccentrically, the DeZurik plug *backs away* from the seat and swings open freely — without friction! No jamming, no sticking, no binding!

EASY OPERATION

It's not necessary to use lubricants to get easy operation with DeZurik Valves. All friction between the plug and the valve body is eliminated by *exclusive* eccentric action!



TIGHT SHUT-OFF

Despite sand, metal chips, string, grit and other solids in the flow, resilient-faced plugs close tightly around any solids deposited on the seat. You get tight shut-off EVERY TIME!

Ask for details on DeZurik Valves; representatives in all principal cities, or write

DeZURIK CORPORATION
SARTELL, MINNESOTA

For Important Information
on Products and Services
see the 1957-1958
WATER & SEWAGE WORKS
REFERENCE and DATA NUMBER

The following firms have information of interest to you in the 1957-58 REFERENCE and DATA NUMBER

Airkem, Inc.
Alabama Pipe Co.
Allis-Chalmers
Amercoat Corp.
American Vitrified Prod. Co.
American Well Works
Anthracite Equipment Co.

Bailey Meter Co.
Beaumont Birch Co.
Bethlehem Steel Co.
B-I-F Industries, Inc.
Borden Metal Products Co.
Builders-Providence Inc.
Byron Jackson Pumps, Inc.

Chain Belt Co.
Chicago Bridge & Iron Co.
Chicago Pump Co.
Clarksville Foundry & Machine Works
Jas. B. Clow & Sons (Iowa)
R. D. Cole Mfg. Co.
Columbia Southern Chem. Co.
Combustion Engineering, Inc.
Cook Well Strainer Co.

Dorr-Oliver, Inc.

Fischer & Porter Co.
Foster Engineering Co.

General Chem. Div.
Allied Chem. & Dye Corp.
General Filter Co.
Golden-Anderson Specialty Valve Co.
Graver Tank & Mfg. Co.
Graver Water Conditioning Co., Inc.

Hardinge Co., Inc.

Infilco, Inc.
Ingalls Iron Works Co.
International Minerals & Chemical Corp.
Iowa Valve Co.

Jeffrey Mfg. Co.
Johns-Manville
John Wiley Jones Co.

Komline-Sanderson Engineering Corp.

Link-Belt Co.
Ludlow-Rensselaer Valve Mfg. Co.

M & H Valve & Fittings Co.
Millipore Filter Corp.
Morse Boulger Destructor Co.
Multiplex Mfg. Co.

Natco Corp.
National Clay Pipe Mfrs., Inc.
National Power Rodding Corp.
Neptune Meter Co.
Nichols Engineering & Research Corp.

Olin-Mathieson Chemical Co.
Omega Machine Co.

Pacific Flush Tank Co.
Pennsalt Chemical Corp. (Western Div.)
Permutit Co.
Phipps & Bird, Inc.
Henry Pratt Co.
Presstite-Keystone Engineering Products Co.
Pressure Concrete Co.
Proportioneers, Inc.

Rensselaer Valve Co.
Roberts Filter Mfg. Co.

Schramm, Inc.
Simplex Valve & Meter Co.
Smith & Loveless, Inc.
S. Morgan Smith Co.
A. P. Smith Mfg. Co., Inc.

Tennessee Corp.

U. S. Pipe & Foundry Co.

Walker Process Equipment, Inc.
Wallace & Tiernan, Inc.
Washington Aluminum Co.
Water Seals, Inc.
Western Machinery Co.
White Diesel Engine Div.
Worthington Corp.

Yeomans Bros. Co.

SCRANTON PUBLISHING COMPANY, INC.
185 N. WABASH AVE., CHICAGO 1, ILL.
155 E. 44th ST., NEW YORK 17, N. Y.

SCRANTON GILLETTE PUBLICATIONS

WATER & SEWAGE WORKS REFERENCE and DATA NUMBER • INDUSTRIAL WASTES • MODERN HIGHWAYS

New Bulletins

CONTINUED FROM PAGE 30A

and special information is provided to aid in installation.

The two-page chart serves as a ready reference on any building product specification.

Mechanical Draft Fan

427

Chicago Blower Corp., Chicago, Ill., has announced a new four-page bulletin describing Chicago's forward curve mechanical draft fans for central power stations and general industrial service.

The bulletin contains a chart graphically illustrating the pressure characteristics of the induced draft fans. The chart demonstrates convincingly the 78 per cent peak efficiency claimed for the fans.

A close up picture of the rotor, included in the bulletin, demonstrates effectively its precise and rugged construction. The flanged ends of the blades, made of mild or alloy steel depending on duty, are either welded or hot riveted to the side plates which are cut from solid stock.

TrenchLiner

428

Parson Co., Newton, Iowa, is now distributing a four-page color bulletin on the recently introduced model 170 "Trenchliner." A wheel-type trencher, the 170 digs 5 ft.-9 in. deep, 20 to 32 in. wide.

Two features of the 170 emphasized in the new bulletin are (1) the Hydraulically Driven Conveyor that gives belt speeds up to 600 ft. per minute, completely independent of digging speeds; and (2) the Exclusive Hydraulic Tilt Mast design which holds the wheel in a vertical position for digging.

Weather-Explosion-Proof Housings

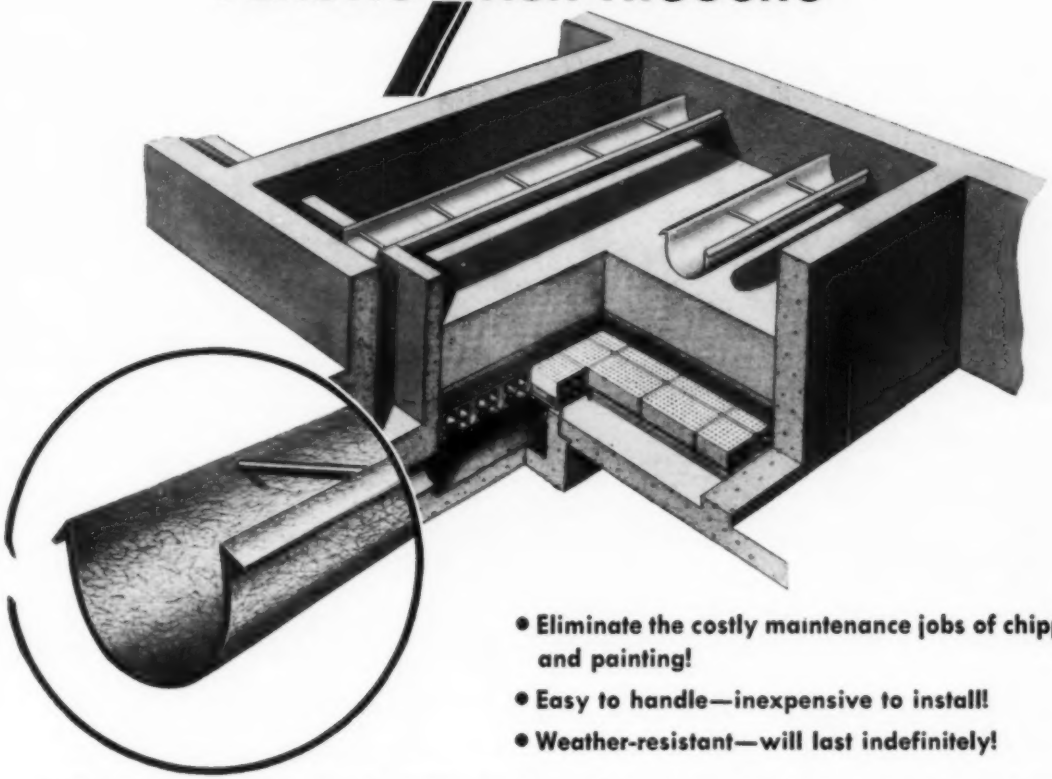
429

The Adalet Mfg. Co., Cleveland, Ohio, has combined into a sixteen page bulletin selection and specifica-

CONTINUED ON PAGE 138A

New Leopold

FIBERGLASS-REINFORCED PLASTIC WASH TROUGHS



- **Eliminate the costly maintenance jobs of chipping and painting!**
- **Easy to handle—inexpensive to install!**
- **Weather-resistant—will last indefinitely!**

With a background of more than 30 years' experience in wash trough design, Leopold has now developed a trough of Fiberglass-Reinforced Polyester-Laminate Plastic—a material that is structurally ideal for wash water troughs.

This new design offers a combination of advantages provided by no other type—uniform strength, dimensional stability, light weight for easy handling, complete resistance to weather and corrosion, built-in sand stop, mold-formed weir edges, and reinforced construction. In addition, Leopold Plastic Troughs, made from extra heavy fiberglass mat, are very durable—will last for years without any painting or other maintenance.

And of particular note—these unique troughs are available in a variety of cross-sectional dimensions, providing capacities to suit individual requirements.

Mail Coupon for Literature —Complete Details

F. B. Leopold Co., Inc.
Zelienople, Pa.

Please send literature on Leopold Fiberglass-Reinforced Plastic Wash Troughs.

Name_____

Address_____

City_____ Zone_____ State_____

New Bulletins

CONTINUED FROM PAGE 136A

tion data for their extensive line of cast aluminum weather-proof and explosion-proof housings. For each housing listed, all photographic, dimensional and written data is gathered together in one spot. "How to Order" information has been "streamlined" to minimize selection time. In addition, a full complement of explosion proof sealing fittings is shown for the more important needs. Also, on the back is listed the Adalet nation-wide Sales and Service Organization, complete with addresses and telephone numbers.

Nooter Field Construction Dept.

430

Nooter Corp., St. Louis, Mo., has published a colorful new brochure that describes, by example, the Field Construction Department of the company.

With the help of a fictitious guide named Bill Boilermaker, the reader is taken on a conducted field tour, by words and pictures, to show some of Nooter's recent field construction jobs.

The illustrated jobs clearly show Nooter's ability to field erect processing and storage equipment anywhere in the United States—and even beyond its borders.

A wide range of processing industries are covered in the brochure, such as: chemical, petroleum, brewing, food, pharmaceutical, and public utilities.

Variable Speed Drives

431

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced the publication of a 8 page colored brochure describing the complete Sterling line of variable speed drives.

The bulletin illustrates several Speed-Trol Motor applications and contains much valuable selection information. Many of Sterling's exclusive design advantages are described and illustrated. In addition to the complete Speed-Trol line as outlined in the new bulletin, Sterling also manufactures a complete line of Standard Motors, a wide range of Slo-Speed Gear Motors and Right Angle Gear Motors.

Glassed Centrifugal Pumps

432

Goulds Pumps, Inc., Seneca Falls, N. Y. and The Pfaudler Co., Div. of Pfaudler Permutit Inc., Rochester, N. Y., have jointly issued a new 16-page "Facts" booklet on the glassed centrifugal pumps.

Included are a brief history of the development of this revolutionary pump and authoritative answers to over 30 of the most frequently asked questions about the pump by chemical and process engineers.

Testing V-Belts

433

Goodyear Tire and Rubber Co., Akron, Ohio, has just released a 16-page, informative booklet entitled, "V-belts, the Testing, Inspection and Control of their Quality."

Fourth in a series, the new booklet describes in words and with pictures how raw materials and finished belts are tested and inspected. One section of the book explains quality control procedures, another is concerned with experimental production.

Aerial view of the modern new sewage treatment plant at Eugene, Oregon.

CHLORINE. A uniform quality waterworks grade of chlorine. Used by hundreds of cities and communities throughout the country because of confidence in PENNSALT'S Quality Control of the product. Shipped in 100 and 150 lb. cylinders and ton containers by rail, truck and water.

AMMONIA, Anhydrous. Waterworks grade, shipped in modern, lightweight cylinders which saves considerable freight cost and lightens the burden of handling. 50, 100, 150 lb. cylinders.

PERCHLORON. High-test calcium hypochlorite containing 70% available chlorine. Shipped in 100 lb. drums; cases—nine 5-lb. cans to a case.

FERRIC CHLORIDE, Anhydrous. Use of PENNSALT'S Ferric Chloride in sewage disposal operations simplifies and improves performance. It provides immediate filtration without the usual losses in sedimentation time in the treatment of fresh or digested sludge. Increases filter efficiency and multiplies vacuum-filter capacities through superior coagulation. Available in non-returnable steel drums of 135 and 350 lbs.

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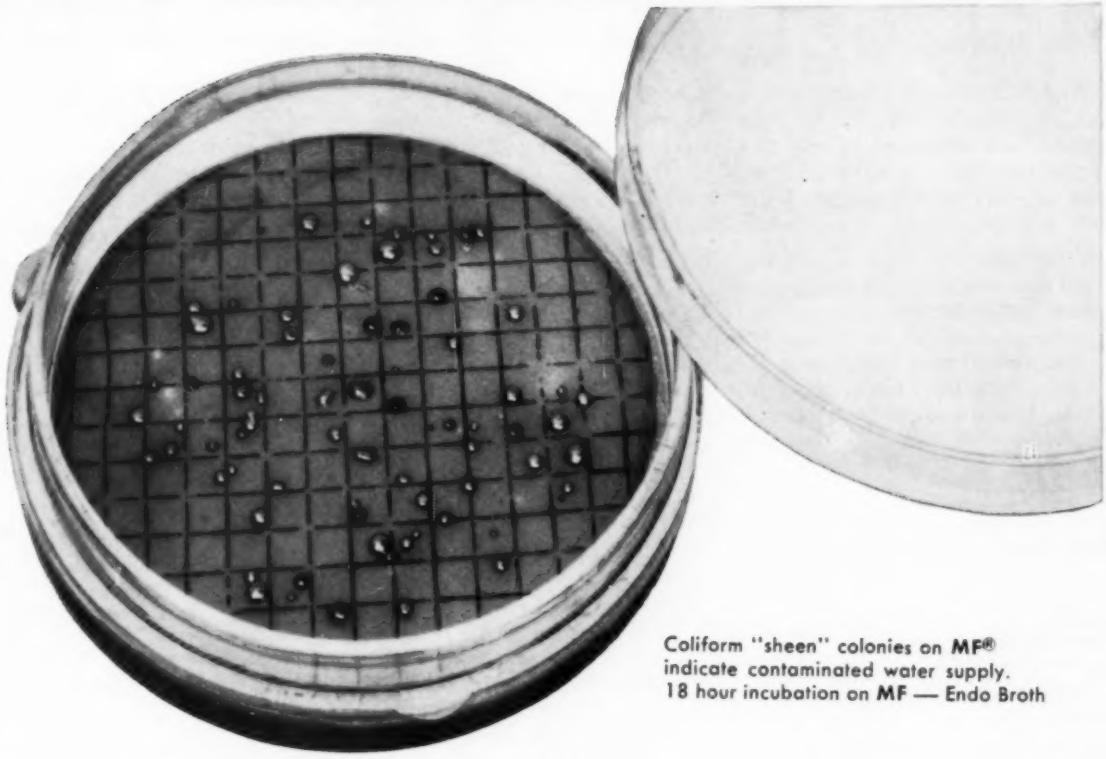

Coliform "sheen" colonies on **MF**®
indicate contaminated water supply.
18 hour incubation on **MF** — Endo Broth

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INCREASED ACCURACY — Entire 100 ml sample tested gives 4 to 5 times more accuracy. Direct count of visible coliform colonies — not a statistical estimate.

FAST RESULTS — Completed test results in 18 hours instead of 48 to 96 hours. Allows precise control of water treatment.

LOWER COST — Less labor, fewer materials, and no glassware breakage actually saves you money. Valuable technical time is released for other jobs.

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- AMERICAN WATER WORKS ASSOCIATION
- NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMY OF SCIENCES

as published in the Tenth Edition of Standard Methods for the examination of Water and Sewage of the American Public Health Association

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Helpful Bulletins *Available Free*

Water Gates
434

Armco Drainage & Metal Products, Inc., Middletown, Ohio, has just published a new illustrated bulletin that shows how this supplier's complete line of gates meet municipal water and sewage control requirements.

Flow Colorimeter
435

Beckman Process Instruments Division, Fullerton, Calif., has announced the availability of a new brochure on the Model 77 Flow Colorimeter.

Grit Collecting and Washing
436

Link-Belt Co., Chicago, Ill., has just published a booklet on Grit Collecting and Grit Washing Equipment. This 28-page book is profusely illustrated, tab indexed, and three-hole punched for permanent retention in the Link-Belt Sanitary Engineering Binder.

Filtration Equipment
437

Commercial Filters Corp., Melrose, Mass., has released a new catalog on Fulflo and CFC Filtration Equipment for micronic clarification of all types of fluids.

Multi-Stage Pumps
438

Economy Pump Div., C. H. Wheeler Manufacturing Co., Philadelphia, Pa., has published a new catalog describing the company's line of vertically split case, multi-stage pumps.

Gasket Type Joint Cast Iron Pipe
439

American Cast Iron Pipe Co., Birmingham, Ala., has just published a brochure on American "Fastite" Joint Cast Iron Pipe.

Wrought Iron Piping
440

A. M. Byers Company, Pittsburgh, Pa., has announced availability of an 8-page booklet entitled "Wrought Iron O. D. Piping," documenting more than a score of typical commercial and industrial wrought iron pipe installations.

Primary Elements Catalog
441

Burgess-Manning Co., Penn Instruments Div., Philadelphia, Pa., has just published a 16-page Primary Elements Catalog #1, the first catalog of its kind.

SK's Instrument Division Products
442

Schutte and Koerting Company, Cornwells Heights, Pa., has announced the publication of Bulletin M-1, a condensed bulletin on Rotameters and Flow Instruments which pictures and briefly describes the division's line of precision instruments for measuring, indicating, recording, and controlling the rate of flow of all types of fluids.

Dual Valve Sludge Pumps
443

Komline-Sanderson Engineering Corp., Peapack, New Jersey, has just released a four-page bulletin on its Diaphragm and Plunger Type-Dual Valve Sludge Pumps.

Ball Joint Pipe
444

American Cast Iron Pipe Co., Birmingham, Ala., has just published a catalog on the American Molox Ball Joint Pipe.

Chemicals Used in Water, Sewage and Waste Treatment
445

Omega Machine Co., B-I-F Industries, Providence, R. I., has just released a revised, and up-to-date issue of their Technical Bulletin on Chemicals Used in Water, Sewage and Waste Treatment.

Pneumatic Sewage Ejectors
446

The Komline-Sanderson Engineering Corp., Peapack, New Jersey has just published a bulletin on its new Pneumatic Sewage Ejector.

Type S Controller
447

Simplex Valve & Meter Co., Lancaster, Pa., has published a comprehensive and well documented 12-page bulletin on the Type S controller. This bulletin will be of interest to engineers, operating and maintenance personnel of municipalities, public works plants, processing industry plants, etc. dealing with water usage and its conservation. Valuable data on details of design, capacities, dimensions, and typical installations are included.

Industrial pH Handbook
448

The Process Instruments Division of Beckman Instruments, Inc., Fullerton, Calif., has announced the availability of **"The Industrial pH Handbook."**

Water Works Valve-Hydrant Catalog
449

Darling Valve & Manufacturing Company, Williamsport, Pa., has just published a 72-page catalog-type bulletin, giving detailed, up-to-the-minute information on gate valves, check valves and hydrants especially developed and produced for Water Works Service.

Instrument Accessories And Supplies
450

The Foxboro Company, Foxboro, Mass., has announced that complete information on industrial instrument **Accessories and Supplies** has been compiled in a new 60-page catalog, available to Foxboro Instrument users. The loose-leaf book, includes specifications, part numbers and prices for more than 250 commonly furnished instrument parts and supplies.

WEINMAN NON-CLOG PUMPS WON'T CLOG EVEN UNDER HEAVIEST LOADS

If the job involves handling liquids carrying large solids, stringy or fibrous trash, raw sewage, sludge or suspended material, a WEINMAN Non-Clog, Type U Centrifugal Pump will more than fill the bill. Weinman non-clog pumps, horizontal and vertical style, are precision built *and* rugged to meet and beat the toughest pumping problems you can throw at them.

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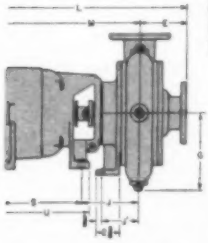
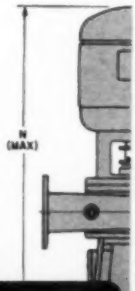
Efficiency, dependability, reasonable purchase price, low operating and maintenance cost . . . these are all factors which make WEINMAN PUMPS the right pumps for your operation. Contact your nearest WEINMAN PUMPS SPECIALIST for immediate service on any and all pumping problems. He's listed in the yellow pages of your telephone book.





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Write today for a free copy of illustrated WEINMAN Bulletins 1400 and 1410, showing specifications, dimensions and construction features of WEINMAN Horizontal and Vertical Non-Clog Pumps.

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ALTITE JOINT

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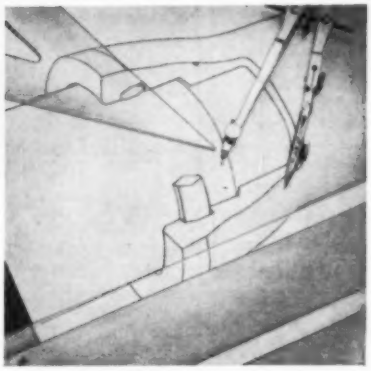
Efficient, Economical and Fool Proof—

The **ALTITE JOINT** has been subjected to a series of rigid tests much more severe than are encountered under the most extreme installation and service conditions in the field. Even under extreme conditions, this joint is so simple to install—you could hardly go wrong if you tried.



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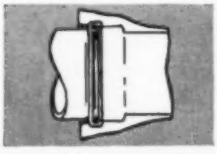
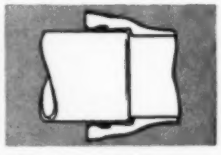
Four Operations As Simple As Falling Off a Log—

Insert Rubber gasket in bell end of pipe — you can't put it in wrong — A child can do it.

Wipe on a small amount of special lubricant—This reduces friction.



Insert plain beveled end of pipe — there are no grooves, ridges or tips on gasket to interfere with smooth insertion.



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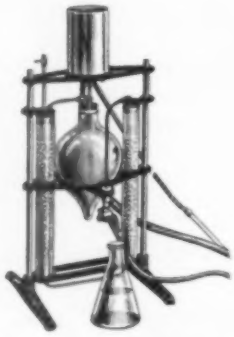

For checking the equilibrium of a finished water, and supplying an index useful in controlling anti-corrosion treatment. Catalog No. 83-895

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Phipps & Bird, Inc.

P. O. Box 2V Richmond 5, Va.

Helpful Bulletins

CONTINUED FROM PAGE 140A

Cut-In Valves

451

Golden-Anderson Valve Specialty Company, Pittsburgh, Pa., has just issued a new four-page bulletin describing their **Cushioned Emergency Cut-In Valve.**

Water & Sewage Gates

452

Armco Drainage & Metal Products, Inc., Middletown, Ohio, has available a new illustrated bulletin showing how their complete line of **Gates** meets municipal water and sewage control requirements.

Ductile Iron Valves

453

Kennedy Valve Mfg. Co., Elmira, N. Y., has just published a new bulletin describing in detail **Kennedy Ductile Iron Valves.**

Bronze Goods Catalog

454

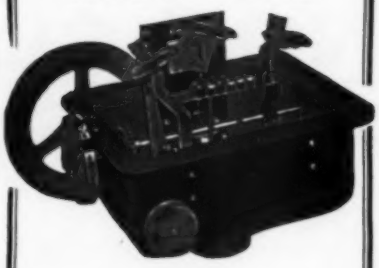
Pubco Bronze, Los Angeles, Calif., has just released a new Bronze Goods Catalog covering their line of Corporation Stops, Service Stops, Curb Stops, Fittings and Valves.

Valve Sizing Charts

455

Jordan Corporation, Cincinnati, Ohio, has just published a 4-page bulletin on **Sizing Charts.**

ROTO-TROL



RF-2

WITH ALTO-TROL

This 2-pump RF-2 Roto-Trol assures equal use and wear of both pumps. Each pump is operated on alternate starting cycles.

The RF-2 operates both pumps together, when required. RF-2 installations give dependable service year after year, with the minimum of attention.

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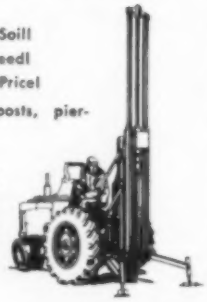
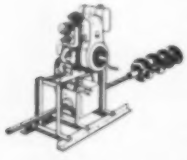
Ideal for poles, posts, pier-holes.

New INDUSTRIAL DIGGER cuts up to 6½ feet through clay, shale, gumbo, tree roots and frozen ground.





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IDEAL for industrial acid and alkaline solutions.
EFFECTIVE filtration from entire bed.
LESS coating, caking or balling with mud, lime, iron or manganese.

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Helpful Bulletins *Available Free*

Rotary Compressors

456

Davey Compressor Co., Kent, Ohio, has released a bulletin showing component parts of its new **Hydrovane Rotary Compressors.**

Rust Prevention Systems

457

L. Sonneborn Sons, Inc., Building Products Division, New York, N. Y., has available a four page brochure outlining applications and advantages of **The Sonneborn Rust Prevention System.**

Geared Flexible Couplings

458

Link-Belt Co., Chicago, Ill., has published a new book describing the company's complete line of improved **Geared Flexible Couplings.**

All Transistor Amplifier

459

The Systems Division of **Beckman** Instruments, Inc., Fullerton, Calif. now has available on request, a four page brochure on the **Beckman All Transistor Amplifier.**

Handling Slip-Joint Clay Pipe

460

Clay Sewer pipe Assn., Inc., Columbus, Ohio, has just published a new two-page bulletin, "Handling, Storing, Installing Slip-Joint Clay Pipe", another in a series of technical bulletins.

Centrifugal Pumps

461

Ingersoll-Rand, New York, N. Y. has just published a bulletin describing Ingersoll-Rand's centrifugal pumps designed for continuous heavy-duty operation within the medium pressure range.

Rotary Compressors

462

Kellogg Division, American Brake Shoe Co., New York, N. Y. has just published a brochure on new rotary air compressors.

Flocculation Equipment

463

Chain Belt Co., Milwaukee, Wis., has just published a new bulletin on Rex Flocculation equipment.

pH Equipment

464

Beckman Process Instruments Division, Fullerton, Calif., has announced the availability of a new eight-page brochure, "Beckman Industrial pH Equipment".

Blower-Compressor

465

Cyclo Blower Co., York, Pa., has just released a four page, 2-color, letterhead-size bulletin announcing the "CycloBlower", an axial-flow, positive-displacement blower for compression and vacuum service in a range from 85 to 3,342 cubic feet per minute.

PHOTOVOLT
pH Meter MOD. 115

A full-fledged line-operated pH Meter of remarkable accuracy at the unprecedented price of **$130.-**
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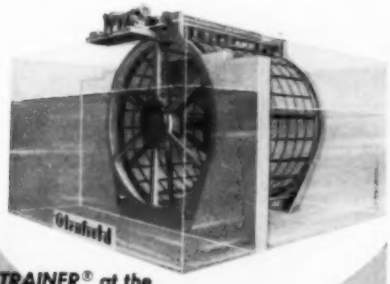

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Single-Home Sewage Treatment System

466

Yeomans Brothers Co., Melrose Park, Ill., has available a bulletin describing and illustrating the Cavitette, the single-home sewage treatment system.

Atomic Water Treatment

467

Hungerford & Terry, Inc., Clayton, N. J., has available for distribution a booklet called "Atomic Kilowatts".

Mixed Flow Pumps

468

Economy Pump Div., C. H. Wheeler Manufacturing Co., Philadelphia, Pa., has released a new twelve-page, 2-color catalog describing axial and mixed flow vertical and horizontal pumps.

Ring Balance Meters

469

Hagan Chemicals & Controls, Inc., Pittsburgh, Pa., has just released a new eight-page bulletin listing performance and specification data for series 3000 Ring Balance Meters and available accessories.

Weather Protected Motor

470

Allis-Chalmers, Milwaukee, Wis., just published a bulletin presenting the features which contribute to the outdoor dependability of A-C weather protected motors (Type FOD) built to NEMA and ASA standards in sizes NEMA frame 505 through 800 hp at 3600 rpm.

Axial Compressor

471

Allis-Chalmers, Milwaukee, Wis., has released a bulletin describing the design and construction features of Allis-Chalmers axial compressors available in sizes from 8,000 to 1,000,000 cfm.

Cast Steel Gate Valves

472

Walworth Company, New York, N. Y., has released a new, four-page illustrated bulletin describing 150-lb and 300-lb cast steel gate valves.

Write Today For 108 Page Catalog
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Male. 25-50. Graduation from college with specialization in chemical engineering and two years of experience in chemical engineering, preferably with sewage treatment plants. Driver's permit. Salary range $5,720—$6,864 annually. Box 1105, Water & Sewage Works, 185 N. Wabash Ave., Chicago 1, Ill.

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For further information, contact

RAY FRY, City Manager

City Hall, Midland, Michigan

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Male. 25-50. College graduate with specialization in chemistry plus two years of experience in sewage treatment plant preferred. Driver's permit. Salary range $4,784—$5,720 annually. Box 1106, Water & Sewage Works, 185 N. Wabash Ave., Chicago 1, Ill.

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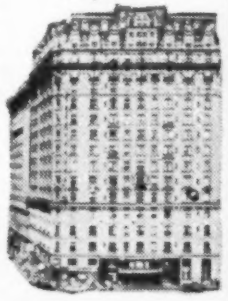

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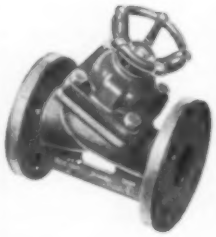

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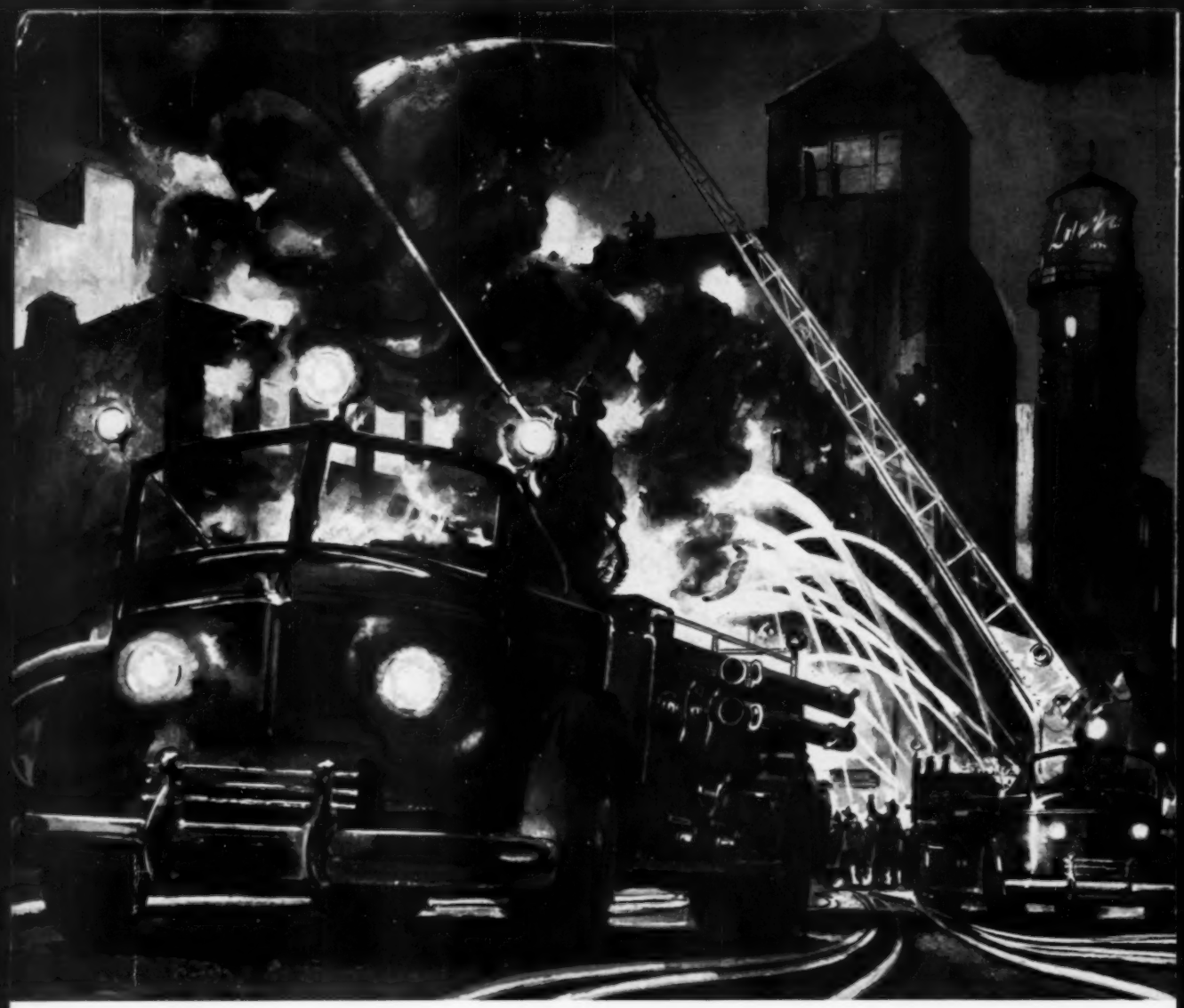

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